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NATURAL ENVIRONMENTAL EFFECTS IN MILITARY MODELS AND SIMULATIONS: PART II—A SURVEY OF CAPABILITIES

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LIST OF ACRONYMS

| | |
|--------------------|--|
| DIS | Distributed Interactive Simulation |
| DMSO | Defense Modeling and Simulation Office |
| DoD | Department of Defense |
| E ² DIS | Environmental Effects for Distributed Interactive Simulation |
| M&S | Modeling and Simulation |
| MEL | Master Environmental Library |
| QBE | Query By Example |
| VV&A | Verification, Validation, and Accreditation |
| VV&C | Verification, Validation, and Certification |

NOTE: Acronyms for the models and databases in the Capabilities Survey database and described in the appendices are identified on pp. 16–21 of the text.

EXECUTIVE SUMMARY

During the past few years, there has been growing interest in the Department of Defense (DoD) regarding modeling and simulation (M&S) activities. Leaders in DoD share a special interest in ensuring that military models and simulations are both realistic and relevant. One technical area that has received considerable emphasis is the **natural environment**—the terrain, atmosphere, ocean, and space environment. The Defense Modeling and Simulation Office (DMSO), in particular, has been a leader in this area by sponsoring and funding several projects that seek to improve the use of the natural environmental effects in a variety of Military Services M&S applications.

The DMSO has sponsored the Environmental Effects for Distributed Interactive Simulation (E²DIS) Project. This effort is a multiagency project that includes scientists primarily from the research laboratories of the Military Services. The E²DIS Project is composed of eight tasks, one of which is the Survey Task. The survey was conducted by a team designed to ensure tri-service coordination. The lead service laboratory for the Survey Team is the Air Force Phillips Laboratory, assisted by the Army Research Laboratory and the Naval Research Laboratory.

The E²DIS Project Survey Task was established in part to develop a baseline of the Military Services current requirements for the incorporation of data on the atmosphere and near space environment and their effects in military models and simulations. This was the Survey Team's first task assignment, routinely called the "Requirements Survey." In addition, the Team was charged with identifying atmospheric and near-space-environment models and databases and environmental effects models and databases that are currently available from the Military Services. This second effort is known as the "Capabilities Survey." In a third effort, the Survey Team was assigned to compare the results from both survey efforts and make appropriate recommendations. Another purpose of the Survey Task has been in a support role: to provide the E²DIS Project-level management personnel with information gleaned during the two survey efforts for their use in guiding the project to meet the needs of the sponsor, the DMSO, and the Military Services M&S community.

This report, the second in a three-part series, documents the results and findings from the Capabilities Survey. A complementary report documents the results from the Requirements Survey. A third report contains a comparison and assessment of the results of both surveys.

The Survey Team developed and implemented a strategy to conduct both the Requirements Survey and the Capabilities Survey. The approach to the strategy included the identification of task drivers for the surveys, development of an execution plan, and implementation of that plan. The major technical task drivers for the Capabilities Survey were (1) scope of the survey task, (2) scope of the Military Services M&S efforts, (3) critical environmental factors for military models and simulations, and (4) value to the warfighter.

Of the 156 environmental models and databases that were identified during the course of the Capabilities Survey, the Survey Team received questionnaires for 152 models and databases. The Team quality-controlled these questionnaires in two ways: by considering each questionnaire's relevance to the Capabilities Survey and by considering the quality of answers to specific questions and informational items in each questionnaire. When necessary, the quality control effort included personal, telephonic, and electronic interviews with the technical expert responsible for the model or database. The net result was that information from all 152 questionnaires was entered into the Capabilities Survey database.

The Capabilities Survey data contained in the database were analyzed by the Survey Team, and the results are presented in this report in aggregate for the 152 environmental models and databases. The quantitative analysis provides technical details on the current capabilities for atmospheric and near space environment in environmental models and databases; it also provides some insights into the support for the M&S community that these capabilities either provide or could provide.

All major atmospheric data and atmospheric effects are available. The two specific atmospheric capabilities most frequently available are transmissivity and clouds, which are available from 24 models and databases. Other frequently available data are temperature, wind, and radiative features, each of which are available from 12 or more models and databases. All of these data are available across a wide range of fidelity in time and space. More than 50 percent of the models and databases provide atmospheric effects on sensors, and 25 percent of the models and databases provide atmospheric effects on military platforms. On the other hand, not even 10 percent of the surveyed models and databases have near-space-environment data capabilities.

The vast majority (97 percent) of the surveyed models and databases support three (of six) DMSO functional areas: Research and Development, Analysis, and Military Operations. This show of support

implies that the remaining functional areas (Test and Evaluation, Production and Logistics, and Education and Training) lack explicit support from the environmental models and databases surveyed.

From a perspective of the M&S hierarchy, the Survey Team noted that Campaign-level models and simulations lack support from the surveyed environmental models and databases. A concentration of support, however, is apparent at the one-on-one M&S hierarchical level, where more than 50 percent of the environmental models and databases surveyed have support capabilities.

FOREWORD

Science and Technology Corporation (STC) is pleased to submit this report "Natural Environmental Effects in Military Models and Simulations: Part II—A Survey of Capabilities," written by Mr. John Burgeson of the STC Nashua, New Hampshire office, and Mr. Thomas M. Piwowar and Dr. Paul D. Try of the STC Washington, DC office. This survey and its companion survey of environmental requirements were developed and conducted under the guidance of the service representatives of the Environmental Effects for Distributed Interactive Simulation (E²DIS) Survey Team: Mr. Donald Grantham (lead), Phillips Laboratory, Hanscom Air Force Base, Massachusetts; Mr. Sam Brand, Naval Research Laboratory, Monterey, California; and Dr. Alan Wetmore, Army Research Laboratory, White Sands Missile Range, New Mexico. The E²DIS Survey Team wishes to extend its thanks to the following personnel who assisted in the Capabilities Survey effort: Dr. Harry Heckathorn, Program Manager, E²DIS ; Lt. Col. J. Lanicci, USAF, Headquarters, Air Staff (AF/XOM); Lt. Col. J. Borger, USAF, Directorate of Weather; Capt. B. Shapiro, USAF, Combat Climatology Center; Dr. G. Ginnet, USAF Phillips Laboratory, Geophysics Directorate; Mr. L. Page, Department of the Army; CDR T. Tielking, USN; and Mr. E. Khedouri and Ms. E. Schroder, Naval Research Laboratory.

1. INTRODUCTION

During the past few years, the Department of Defense (DoD) has become increasingly concerned about modeling and simulation (M&S) activities. Leaders in DoD share a special interest in ensuring that military models and simulations are both realistic and relevant. One technical area that has received considerable emphasis is the **natural environment**—the terrain, atmosphere, ocean, and space environment. The Defense Modeling and Simulation Office (DMSO), in particular, has been a leader in this area by sponsoring and funding several projects that seek to improve the use of the natural environmental effects in the Military Services M&S applications. To do so, it was necessary to determine the baseline of M&S environmental requirements and the capabilities to satisfy these requirements.

1.1 BACKGROUND

One such project initiated in fiscal year 1993 is the Environmental Effects for Distributed Interactive Simulation (E²DIS) Project (Heckathorn, 1994; Naval Research Laboratory, 1994, 1995). This project is a multiagency project under the management lead of the Naval Research Laboratory, Washington, DC, and includes scientists from the research laboratories of the Military Services. The E²DIS Project is composed of eight tasks, one of which is the Survey Task. The lead service laboratory for the E²DIS Project Survey Task is the Air Force Phillips Laboratory, Geophysics Directorate, Hanscom Air Force Base, Massachusetts. Army and Navy scientists from the Army Research Laboratory, Battlefield Environment Directorate, White Sands Missile Range, New Mexico, and the Naval Research Laboratory, Marine Meteorology Division, Monterey, California, are assisting Phillips Laboratory in managing the Survey Task.

1.2 PURPOSE

The E²DIS Project Survey Task established a tri-service team to conduct a survey to baseline the current status of the incorporation of data on the atmosphere and near space environment and the effects of these natural environments in military models and simulations. The Survey Team was also charged with identifying potential future requirements for incorporation of data on the atmosphere and near space environment, and their effects, in these models and simulations. Another purpose of the surveys was to provide information to E²DIS Project-level management personnel for their use in guiding the project to meet the needs of the sponsor, the DMSO, and the Military Services M&S community.

A priori, the E²DIS Project assumed that there might be some shortfalls or deficiencies in incorporating the natural environment. Therefore, the Survey Team was assigned the additional responsibilities of (1) identifying and cataloging the DoD environmental models and databases that might be useful in more realistically representing the atmosphere and near space environment, and (2) assessing the capabilities of these environmental models versus the requirements for the incorporation of data on the atmosphere and near space environment in military models and simulations. This report catalogs the atmospheric and near-space-environment models and databases only.

1.3 SURVEY FOCUS

One of the first key steps for any project or task is to determine the scope, or constraints, of the effort desired. The E²DIS Project Survey Team concluded early on that the focus of its efforts should be directed toward the Military Services in terms of their M&S environmental requirements and their environmental modeling and database capabilities. For the technical constraint on its effort, the Survey Team was specifically assigned to focus on the atmosphere and near space environment only. The focus was concentrated on environmental modeling and database capabilities available on electronic data processing systems, although some capabilities described only in the literature were also surveyed. Some examples of other catalogs of environmental capabilities are the *Directory of Climatic Databases*, AFCCC/TN-96/001, January 1996; *Selective Guide to Climatic Data Sources*, U.S. Department of Commerce, National Environmental Data and Information Service, December 1988; and *Guide to Standard Weather Summaries and Climatic Services*, Naval Air Systems Command, Washington, DC, NAVAIR-50-1C-534, April 1986.

The Survey Team noted that modeling and simulation database requirements for the terrain portion of the natural environment were already surveyed and documented under the aegis of an earlier DMSO-sponsored project led by the Defense Mapping Agency (1993). Ocean requirements for military models and simulations and ocean modeling and database capabilities are being identified by another DMSO-sponsored project, the Master Environmental Library (MEL) Project (Siquig et al., 1995). The Survey Team members have coordinated with the personnel developing the DMSO projects to avoid duplication of survey efforts.

2. SURVEY STRATEGY

The E²DIS Project Survey Team determined that prior to executing its task some planning was critical to achieving success with its survey efforts. During the planning phase, a basic approach was identified, discussed, and agreed upon. This approach included three fundamental components: (1) identification of key task “drivers,” (2) development of an execution plan for the surveys, and (3) implementation of the plan and other associated task efforts.

2.1 TASK DRIVERS

For any task, certain key factors, or drivers, dominate how the task is performed. Early recognition and identification of these factors assist greatly in formulating a reasonable strategy to accomplish the task. For this survey effort, the Survey Team responded to the following task drivers:

- Approach to surveying environmental capabilities
- Critical environmental factors for Military Services models and simulations
- Value to the warfighter
- Time and funding constraints

These are discussed in the following subsections.

2.1.1 Approach to Surveying Environmental Capabilities

The first key driver for the Survey Task was the perceived scope of the Military Services M&S user community and the Military Services environmental database and modeling community. Similar to the approach taken for the Requirements Survey (Piwowar et al., 1996), the Survey Team chose a “top-down” approach, as opposed to a “bottom-up” approach, for the development and execution of its tasking effort for the Capabilities Survey. The top-down approach essentially meant that the Survey Team would initially coordinate any survey plan with each of the four Military Services headquarters principal points of contact for atmospheric and near-space-environment models and databases. The bottom-up approach, on the other hand, would have meant that the Survey Team would pursue numerous, individual points of contact within the Military Services environmental modeling and database community.

The Survey Team selected the top-down approach because such an approach would make the Military Services headquarters aware of the survey and inform the principal points of contact of the intent

of the survey well before the subordinate organizations were requested to expend personnel resources in response to any survey questions. The Survey Team considered this an important advantage in case difficulties were experienced in getting responses to survey questions. Although the top-down approach would equate to more time being spent initially coordinating the Capabilities Survey effort with the Military Services headquarters, the Survey Team's government representatives accepted the minimal scheduled risk in view of the benefits associated with this approach.

2.1.2 Critical Environmental Factors for Military Services Models and Simulations

The essence of the entire survey effort centered around the identification and defining of the Military Services requirements for incorporation of data on the natural environment—the atmosphere and the near space environment—in the Services M&S activities. In other words, it was necessary to determine the critical environmental factors for each model and simulation. This key task driver dominated the survey effort. It was reflected in the number of items requesting information posed to both the Military Services M&S community and the environmental modeling and database community. (Subsection 2.3 contains an indepth discussion on this material and the questionnaire that was developed to support the Capabilities Survey effort.)

2.1.3 Value to the Warfighter

Another key driver was “Value to the Warfighter.” Warfighters are the ultimate customers for all the Military Services M&S activities, either directly or indirectly, individually or collectively. Their operational experiences in the real world’s natural environment provide them with first-hand familiarity of the effects the natural environment can have on their own forces, platforms, weapons, communications, and sensor systems—and the enemy’s as well. **For a simulation to be realistic, hence, valuable, in the eyes of a warfighter, the effects of the natural environment should be properly taken into account.** The structure of the Survey Questionnaire attempted to use terms familiar to warfighters, as well as terms familiar to the military environmental modeling and database community.

2.1.4 Time and Funding Constraints

Two significant drivers for most tasks are time and funding constraints. The E²DIS Project Survey Task was no different. It was limited to 2 years, which ended September 1995. Funding constraints limited the amount of personnel resources assigned. These two constraints combined, consequently, to limit the number of M&S efforts pursued.

2.2 EXECUTION PLAN DEVELOPMENT

Given the key task drivers, the Survey Team developed a plan to execute its top-down strategy. This plan included the following major components:

- Soliciting support from the DMSO and key service points of contact
- Developing and testing the Capabilities Questionnaire
- Drafting and coordinating the letters of intent
- Conducting the survey using questionnaires and telephone and personal interviews with technical experts
- Designing and managing a database
- Analyzing the data from returned questionnaires
- Reporting the results of the analysis

These components are discussed in the following subsections.

2.2.1 The DMSO and Military Services Support

Liaison visits, meetings, and briefings were conducted early in the Survey Task's schedule to obtain support in principle from the DMSO and the Military Services. Consistent with the top-down approach, the first such visit was made to the DMSO representative for the E²DIS Project in August 1993. The DMSO representative provided the Survey Team with an overview of DMSO background, mission, goal, and objectives. This visit indicated that the DMSO was fully supportive of the E²DIS Project in general and the Survey Task effort in particular.

Visits and meetings with the points of contact of the Army, Navy, Marine Corps, and Air Force staffs were subsequently conducted. All four Services were briefed on the E²DIS Project and the Project Survey Task effort. They unanimously agreed to the intentions of the survey and affirmed their support for future coordination efforts associated with the Survey Task.

2.2.2 Capabilities Questionnaire

Based on the collective experience of the Survey Team members, a questionnaire for the Capabilities Survey was developed. The following subsections describe not only this development but also the testing of the Capabilities Questionnaire.

2.2.2.1 Development

In parallel with soliciting and garnering support from the DMSO and the four Military Services, development of questionnaires for both the Requirements Survey and the Capabilities Survey began. Since the results of both surveys (i.e., the responses from both the Requirements and Capabilities Questionnaires) would eventually be compared and assessed, the E²DIS Project Survey Team decided to structure the questionnaires as similarly as possible. Both questionnaires were divided into two parts: administrative information and technical information. A copy of the Capabilities Questionnaire is presented as Appendix A.

The administrative information section of the Capabilities Questionnaire requested information on such items as the model or database title, a brief general description of the model or database, and the identity of a technical expert for the model or database, as well as the principal service owner. This type of information would be critical in attempting to perform quality control, or followup work, on the responses to various questions.

Using the top-down approach, the Survey Team decided to develop some applications items and questions based on the M&S technical structure that was established by the DMSO in conjunction with the Military Services and other DoD component organizations. In this way the Survey Team sought to construct a framework for the questionnaires that would be relevant to and understandable by the DMSO and the Military Services M&S community.

The technical information section of the questionnaire was the essence of the survey. It has seven subsections and three attachments. The seven subsections are discussed below.

1. **Critical Environmental Factors.** The Survey Team considered that it was important for the respondents to highlight early in the questionnaire the critical factors for the model or database regarding the atmosphere and near space environment. At this point technical experts for the model or database were also provided with an opportunity to respond in qualitative terms to the key atmospheric and near-space-environment issues without going into detailed quantitative responses, which are required later in the questionnaire. The Survey Team also anticipated that responses for this subsection could be used to assist in quality controlling the questionnaire's more detailed answers.

2. **Status of the Model or Database.** The respondents were asked for only a few basic facts concerning the status of the model or database. The Survey Team wanted to know: Is the model or database being used today? If so, how often? If it is not being used today, when will it be used?
3. **Application of the Model or Database.** Application is often a key reference point. Information was requested about the application of the model or database in terms of its use in DIS, the type of simulation it is used for, its functional use, its hierarchical category, the types of applications supported, its military contents, and its documentation. In this subsection the DMSO technical structure was explicitly integrated. Specifically, the Survey Team used the three types of simulations (i.e., constructive, virtual, and live play) in one item. The next item contained a list of six functional areas: Education and Training, Research and Development, Test and Evaluation, Analysis, Production and Logistics, and Military Operations (Under Secretary of Defense for Acquisition and Technology, 1995).

During an early liaison visit with an Air Force representative, an important point on the hierarchy of models and simulations was made by the representative. *De facto* in the Air Force, models and simulations were categorized according to the scheme shown in Figure 1.

This scheme, however, raised another corollary issue: If the Air Force had such a hierarchy, do the other services have a modeling and simulation hierarchy? After several visits and conversations with representatives from the Army, Navy, and Marine Corps, it was determined that only the Army had an established M&S hierarchy. It is shown in Figure 2.

As shown in Figures 1 and 2, the Air Force hierarchy is platform and weapon system oriented while the Army hierarchy is force and personnel oriented. An item for the Capabilities Questionnaire was developed that incorporated both hierarchies.

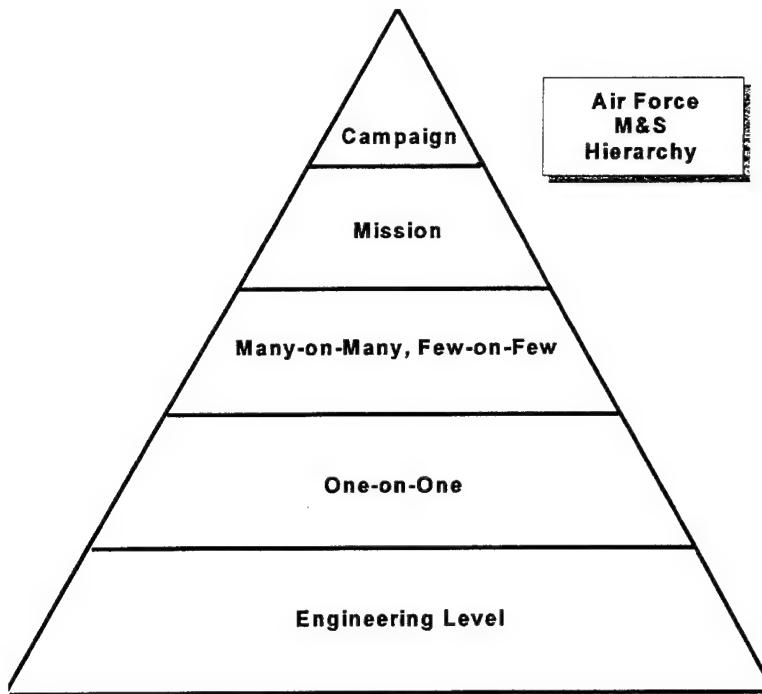


Figure 1. Air Force hierarchy of models and simulations.

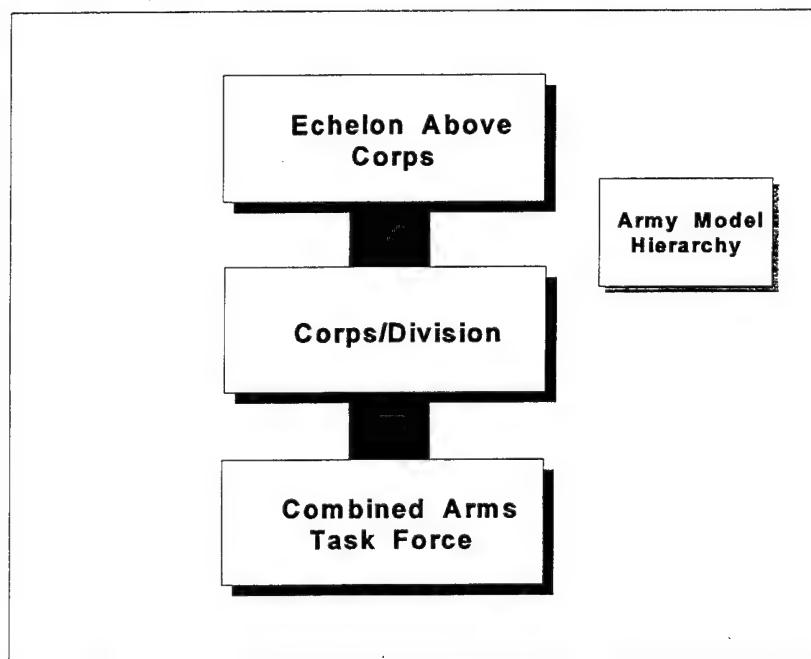


Figure 2. Army hierarchy of models and simulations.

In the Applications subsection respondents were queried on the specific military aspects of the model or database. Information was requested on the types of applications supported, such as sensor acquisition of targets and mobility of forces and platforms. In addition, order-of-battle information was requested in general terms to help in understanding the complexity and use of the model or simulation.

The next-to-last item in the Applications subsection requested identification of a user manual for the model or database. The last item requested information on the primary customer for the model or database.

4. **Domain of the Model or Database.** The Survey Team categorized the model or simulation's domain in terms of the space (horizontal surface and vertical) dimensions and time dimension. Again, this information was needed to help the Survey Team understand the complexity and use of the model or database. The items pertaining to the horizontal and vertical domains included references to the ocean environment. This information was included to assist the MEL Project team members in their complementary survey effort of ocean capabilities for military models and simulations.
5. **Current Capabilities.** Given the preceding subsections of the questionnaire, which were relatively general in nature, this subsection focused on detailed quantitative questions and informational items about the model or database's current capabilities for atmospheric data and effects and near-space-environment data and effects. Three attachments requested detailed information. The first attachment focused on the atmosphere. The second attachment contained similar choices for the near space environment. The third attachment sought information on other technical areas, such as verification, validation, and accreditation. Answers to these detailed capabilities-oriented questions and items were necessary for the Survey Team to compare with answers resulting from the Requirements Survey questionnaires and to assess this comparison.
6. **Future Capabilities.** A few questions and informational items were posed in this subsection of the Capabilities Questionnaire to determine if the model or simulation was planned for an upgrade. If so, whether the upgrade might change the current capabilities

for atmospheric or near-space-environment data; if not, whether an upgrade should be considered if environmental data and environmental effects data would be required by a simulation user.

7. **E²DIS Project Briefing.** The Survey Team considered the possibility that some Capabilities Questionnaire respondents might not be familiar with the E²DIS Project. It was decided that a question be included in the Capabilities Questionnaire that requested respondents to indicate the need for a briefing on the project.

2.2.2.2 Beta test

Before distributing the Capabilities Questionnaire to the many different organizations in the Military Services, the Survey Team conducted a beta test on the questionnaire. Representatives from the Air Force Environmental Technical Applications Center (USAFETAC, which was renamed the Air Force Combat Climatology Center [AFCCC] on 1 August 1995) and Air Force Phillips Laboratory (USAF/PL) volunteered to perform this test. Some substantive comments and recommendations were received and integrated into the questionnaire to improve its quality. Appendix A contains the final version of the Capabilities Questionnaire used in the survey.

2.2.3 Letters of Intent

To implement the survey, the Survey Team drafted a letter that described the overall intent of the Capabilities Survey and provided a copy of the Capabilities Questionnaire for information. Taking the top-down approach, the Survey Team coordinated draft letters with the Military Services environmental modeling and database community.

The Survey Team coordinated meetings and briefings to discuss the intent of the draft letter with each of the Military Services primary point of contact for M&S. The Air Force was the first service to release a letter to its organizations. The Army and Navy followed within a few weeks to release their letters. It should be noted that the Navy was also responsible for requesting responses from the Marine Corps and the Coast Guard. Copies of the Air Force, Army, and Navy correspondence are contained in Appendix B.

2.2.4 Interviews

The Survey Team perceived the interview process with technical experts for the environmental models and databases as optional in the event any capabilities questionnaires were returned with incomplete or unclear responses.

2.2.5 Database

The Survey Team selected off-the-shelf software, *PARADOX for Windows*—Version 5, for database management of the Requirements Survey and Capabilities Survey sets of data. The program provided an efficient, structured method to organize, archive, retrieve, analyze, and display data.

2.2.5.1 Database design

Using the capabilities of the *PARADOX for Windows* software program, the Survey Team designed the Capabilities Survey database to accomplish two important goals:

- Provide a standard methodology by which the large amount of surveyed information could be managed.
- Ensure that the database could be easily understood by anyone familiar with relational databases and be *relatively* easy to use by someone who was not completely familiar with relational databases.

With these two goals in mind, the Survey Team designed the database such that the Capabilities Questionnaire was associated with 23 database tables. All 23 database tables corresponded directly to questions in the Capabilities Questionnaire.

Each database table contained relational information and a common field that allowed the tables to be linked together. Typically, this linkage was accomplished by using a “model or simulation tracking number,” which was an arbitrary, but unique, number assigned to each questionnaire received. Each record (row), or group of records, in a table corresponded to a specific questionnaire; each field (column) corresponded to a specific questionnaire entry. The model or simulation tracking number was used in most of the database tables as the initial field entry.

In keeping with sound relational database development theory and practice, the database tables were small in terms of the number of fields. No table had more than 18 fields, and most tables had 10 or less. The

database tables, their relationship to the Capabilities Questionnaire, and the contents of each field in a table are described in detail in Appendix C.

2.2.5.2 Database management

The Capabilities Survey accumulated a formidable amount of data from the 152 questionnaires. The Survey Team personnel archived the data by manually entering the data from each of the capabilities questionnaires received into the appropriate database tables. To minimize opening and closing tables and to allow checking of similar data for inconsistencies or input errors, data for the same portion of several questionnaires were entered into the appropriate database table simultaneously. After sufficient data were entered into these tables, retrieval and analysis of the data could begin.

The database management system has the capability, called Query By Example (QBE), to ask questions (or queries) about data, explore data in the database, and obtain answers quickly. A query can be a simple question in a single table, or a complex question involving several tables. The QBE provided a powerful means to extract pertinent information from a large amount of data that otherwise would have been difficult to analyze. The results of queries, called "answer tables," were used as basic input for the Survey Team's analysis reported in Section 3. In addition, database management system "reports" that summarize and display relational information were generated and used by the Survey Team to analyze the acquired data.

One example of a database management system report that the Survey Team used was "LISTCAPB.RSL." It is a report that sorts the models and databases first by service, then alphabetically by model or simulation title. Also included in the report is a description of the model or database, as well as the critical environmental factors or issues that pertain. A listing of all database management system reports used by the Survey Team is given in Appendix D.

2.2.5.3 Database availability

The complete database consists of tables, queries, and reports in *PARADOX for Windows*—Version 5.0. It can be obtained from the Phillips Laboratory/Geophysics Directorate Atmospheric Structures Branch (PL/GPAA), 23 Randolph Road, Hanscom Air Force Base, Massachusetts, 01731-3010.

2.2.6 Analysis of Data

Reliance on the QBE capabilities of the *PARADOX for Windows* software program was fundamental in planning for the quantitative analysis of the Capabilities Survey technical data. By simply querying the Capabilities Survey database, retrieval and analysis of responses to each question and item from the technical section of the Capabilities Questionnaire was planned.

For each item having prescribed multiple choices for answers, sorted sets of answers were retrieved. All questionnaires responding with the same answer choice to a given item were grouped, or sorted, into a set; the number of sorted sets, therefore, corresponded to the number of possible answer choices for that given item. The use of soft-copy answer tables and paper-copy tabular reports was planned for the initial analysis of the basic, sorted answer sets. Graphical display and additional analysis of these same basic answer sets were also planned for the report-writing phase. Using *Word Perfect Draw 3.0* as the software graphics program, answer sets for each question would be displayed in soft copy and analyzed.

Not all the items had multiple choice answers, however. Each item that required a free-formatted, fill-in-the-blank type answer had to be reviewed and compared with the same item and corresponding answer in other questionnaires. Again the QBE capability would be used to query the database for these types of answers. Where similar answers were being provided, the Survey Team would plan to sort those into arbitrary groups for use in further analysis and final reporting.

To determine whether there might be a relationship between responses to one item and responses to another item, second-generation answer tables and reports could, and would, be constructed. Again the QBE capability would be used when necessary.

2.2.7 Report of Results

The final major component, or step, in developing the Survey Execution Plan was to report the results of the analysis of the Capabilities Survey data. This report was developed to record such results, including responses to all the items and questions from the technical section of the Capabilities Questionnaire. It is organized in a typical technical or scientific report format and is the second report in the series: Natural Environmental Effects in Military Models and Simulations: Part I—A Survey of Requirements; Natural Environmental Effects in Military Models and Simulations: Part II—A Survey of Capabilities; and Natural Environmental Effects in Military Models and Simulations: Part III—An Analysis

of Requirements Versus Capabilities. The results of the Capabilities Survey in conjunction with the results of the complementary E²DIS Project Requirements Survey will contribute to the understanding of some technical aspects of both the Military Services M&S and environmental science communities.

2.3 IMPLEMENTATION

With the signing, release, and distribution of the first service letter (the Air Force letter of 22 December 1994, officially announcing the intent of the survey effort within the Air Force), the Capabilities Survey implementation phase began. Simultaneous with this implementation, the Survey Team continued to coordinate with the Army and Navy until they announced the E²DIS Project Capabilities Survey via formal letters. (See Appendix B for correspondence from the Air Force, Army, and Navy regarding these announcements.) Included in the Navy's distribution was a Coast Guard organization that eventually provided a completed questionnaire on an iceberg model. Since this questionnaire does not contain any atmospheric or near-space-environment data capabilities, it is not applicable to the E²DIS Project Capabilities Survey; however, it should be useful for the MEL Project Survey Task. A summary of the Military Services responses is shown in Table 1. Appendix E provides a list of all the models and databases surveyed and Appendix F provides a description of each model and database.

Table 1. Capabilities Survey Results

| Service/ Agency | Capabilities Survey Results | | | |
|--------------------|-----------------------------------|---------------------------------------|--------------------------------|---------------------------------------|
| | No. of Organizations Polled | No. of Organizations Responding | No. of Major M&S Efforts | No. of Questionnaires Completed |
| Army | 6 | 5 | 31 | 31 |
| Navy | 26 | 14 | 60 | 58 |
| Marine Corps | 1 | 0 | 0 | 0 |
| Air Force | 7 | 3 | 65 | 63 |
| Coast Guard | 1 | 1 | 0 | 0 |
| Totals | 41 | 23 | 156 | 152 |

The Survey Team made a concerted effort to ensure that the quality of the returned capabilities questionnaires was adequate in terms of applicability and detail. This two-pronged quality control effort meant that each questionnaire was reviewed for general applicability to the Capabilities Survey and, if passing that test, was reviewed in detail for completeness. As a result of the first step in the quality control effort, one capabilities questionnaire from the Coast Guard (identified in the preceding paragraph) was not entered. The applicable 152 capabilities questionnaires were scrutinized for completeness and, when necessary, the Survey Team contacted the technical expert indicated on the questionnaire about missing or unclear answers.

It is important to note that the Survey Team placed particular quality control emphasis on ensuring that answers to questions and items related to atmospheric and near-space-environment data types and associated time and space resolutions were provided. These answers, crucial to the overall effort of the Team, are the basis for comparing the modeling capabilities of the environmental science community with the requirements of the M&S community for the same atmospheric and near-space-environment data types. This comparison is reported in Burgeson et al., 1996.

The list of environmental models and databases that were used by the Survey Team to compile the results in this document is duplicated here. In Appendix F the list is expanded to include a brief description of each model and database, along with the identified technical point of contact and critical environmental factors.

| <u>Service or Agency</u> | <u>Models and Databases in the Capabilities Survey Database</u> | <u>Model/DB No.¹</u> |
|--------------------------|---|---------------------------------|
| Army: | 1. AGAUS-A Mie Code | 639 |
| | 2. BITS-Broadband Integrated Transmittances | 612 |
| | 3. CLIMAT-The Climatology Model | 613 |
| | 4. COMBIC-Combined Obscuration Model for Battlefield-Induced Contaminants | 614 |
| | 5. COPTER-Obscuration Due to Helicopter-Lofted Snow and Dust Module | 615 |
| | 6. FASCAT-Atmospheric Illumination Module | 616 |
| | 7. FITTE-The Fire-Induced Transmission and Turbulence Effects Module | 617 |
| | 8. GRNADE-Self-Screening Applications Module | 618 |
| | 9. ILUMA-Natural Illumination Under Realistic Weather Conditions | 619 |
| | 10. KWIK-A Munition Expenditures Module | 620 |
| | 11. LASS-Large Area Screening Systems Application Module | 621 |
| | 12. LOWTRN-Atmospheric Transmittance/Radiance Module | 622 |
| | 13. LZTRAN-Laser Transmittance Module | 623 |
| | 14. MPLUME-Missile Smoke Plume Obscuration Code | 624 |
| | 15. NAPS-Noise Assessment and Prediction System | 637 |
| | 16. NBSCAT-Narrow Beam Multiple Scattering Module | 625 |
| | 17. NMMW-Near-Millimeter Wave Module | 626 |
| | 18. NOVAE-Nonlinear Aerosol Vaporization and Breakdown Effects Module | 627 |
| | 19. OVRCST-Contrast Transmission Module | 628 |
| | 20. PEGASUS | 601 |
| | 21. PFNDAT-Aerosol Phase Function Database | 629 |
| | 22. RADAR-Millimeter Wave System Performance Module | 630 |
| | 23. REFRAC-Optical Path Bending Code Module | 631 |
| | 24. SCAPE-Scanning Parabolic Equation | 636 |
| | 25. SCAPPF-Scanning Fast Field Program Module | 632 |
| | 26. Spherical-Ground Impedance Model Based on Equations by Attenborough | 638 |
| | 27. SWOE-Smart Weapons Operability Enhancement | 610 |

¹The model or database identification number describes the order of the sorting in Appendix F.

| <u>Service or Agency</u> | <u>Models and Databases in the Capabilities Survey Database</u> | <u>Model/DB No.</u> |
|--------------------------|---|--|
| Army: (continued) | 28. Synthetic Environments 29. TARGAC—Target Acquisition Model 30. UVTRAN—An Ultraviolet Transmission and Lidar Simulation Module 31. XSCALE—Natural Extinction Module | 609 633 634 635 |
| Navy: | 1. AIRICE—Aircraft Icing 2. AAW—Anti-Air Warfare Aircraft Stationing Aid 3. BALWIN—Meteorological Ballistic Winds and Densities Model 4. BGV—Battle Group Vulnerability 5. CARDS—Create Atmosphere Refractive Data Set 6. CCD—Chaff Corridor Density Model 7. CHADIS—Chaff Dispersion and Density Model 8. CHATRA—Chaff Trajectory Function Model 9. CLUTTER—The Ocean-Atmosphere Model Library (OAML) Navy Standard Radar Sea Clutter Model 10. COAMPS—Coupled Ocean/Atmosphere Mesoscale Prediction System 11. D-Values 12. DMED—Direct Method Evaporation Duct Model 13. ECM—Electronic Countermeasures Effectiveness Display 14. EDH—Evaporation Duct Height Model 15. EM COVER—Electromagnetic Coverage Diagram 16. EM LOSS—Electromagnetic Path-Loss vs. Range 17. ESM—Electronic Support Measures Range Tables 18. FLIR—Forward-Looking Infrared System Prediction 19. HEPC—Historical Electromagnetic Propagation Conditions 20. HF COMMS—High Frequency Communications 21. HF LUF—High Frequency Lowest Usable Frequency 22. HF MUF—High Frequency Maximum Usable Frequency 23. HWS—Historical Wind Speed 24. LRP—Laser Range Prediction | 707 708 709 710 711 712 715 713 714 733 719 734 738 739 740 741 742 743 744 745 747 749 746 748 |

| <u>Service or Agency</u> | <u>Models and Databases in the Capabilities Survey Database</u> | <u>Model/DB No.</u> |
|--------------------------|--|---------------------|
| Navy: (continued) | 25. MVOI—Multivariate Optimum Interpolation | 750 |
| | 26. NOGAPS—Navy Operational Global Atmospheric Prediction System | 706 |
| | 27. NORAPS—Navy Operational Regional Atmospheric Prediction System | 705 |
| | 28. ODP—Orbit Determination Program | 702 |
| | 29. Ooyama Analysis | 751 |
| | 30. PADA—Pressure Altitude/Density Altitude | 752 |
| | 31. PCS—Electromagnetic Propagation Conditions Summary | 737 |
| | 32. PIBAL—Pilot Balloon | 753 |
| | 33. Platform Vulnerability | 754 |
| | 34. RADFO—Radiological Fallout | 755 |
| | 35. RFSDR—Radar Free-Space Detection Range | 756 |
| | 36. RIA—Radiosonde Initial Analysis | 757 |
| | 37. RPO—Radio Physics Optics | 758 |
| | 38. RRM—Rowland-Rotter Evaporation Duct Model | 735 |
| | 39. Seasonal Cloud Amount and Cloud-Free Line-of-Sight Data for Oceans | 761 |
| | 40. SEP—Seakeeping Evaluation Program Wind and Wave Database | 701 |
| | 41. SHIP ICE—Ship Ice Accretion | 759 |
| | 42. SLAP—Solar/Lunar Almanac Program | 724 |
| | 43. SOCUS—Sound Focus | 725 |
| | 44. Standard EM Prop—Standard Electromagnetic Propagation | 727 |
| | 45. STE—Submarine Technological Environmental Database, Clouds | 704 |
| | 46. SRR—Surface Search Radar Range Table | 728 |
| | 47. SSTAC—Sea Surface Temperature Analysis and Composite | 726 |
| | 48. TASMS—Tomahawk Anti-Ship Missile Effective Wind Model | 729 |
| | 49. TECA—Tomahawk Environmental Calculation Aid | 730 |
| | 50. TEKBS—Tactical Environmental Knowledge Base System | 703 |
| | 51. TEMPER—Tropospheric Electromagnetic Parabolic Equation Routine | 736 |
| | 52. TEMP UTIL—Temperature Utility | 731 |
| | 53. TESR—Tactical/Environmental Ship Routing | 732 |

| <u>Service or Agency</u> | <u>Models and Databases in the Capabilities Survey Database</u> | <u>Model/DB No.</u> |
|--------------------------|---|---------------------|
| Navy: (continued) | | |
| | 54. TLAM Wind and Temperature Correction—Tomahawk Land Attack Missile Wind and Temperature Correction Model | 723 |
| | 55. Tropical Cyclone Module | 722 |
| | 56. TRUE WIND—Wind Conversion Utility | 721 |
| | 57. VLSTRACK—Chemical/Biological Agent Vapor, Liquid, and Solid Model | 760 |
| | 58. Warnings Plot | 720 |
| Air Force: | | |
| | 1. 3DNEPH—Three Dimensional Nephanalysis (stored in 6-month increments) | 544 |
| | 2. 3DNEPH-LMHT/A Hemispheric | 545 |
| | 3. 5-Layer Cloud Model | 523 |
| | 4. A Climatological Model for 1-Minute Precipitation Rates | 558 |
| | 5. ACT/EOS—Air Combat Targeting/Electro-Optical Simulation | 503 |
| | 6. AFGL-TR-89-0012, Effects of Rain Attenuation on Satellite EHF Communication in the United States | 557 |
| | 7. AGRMET | 521 |
| | 8. ARC/AARC—Atmospheric Radiance/Auroral Atmospheric Radiance Code | 512 |
| | 9. ASPAM—Atmospheric Slant Range Path Analysis Model | 522 |
| | 10. Boundary Layer Window Analysis | 548 |
| | 11. CBSD—Celestial Background Scene Descriptor | 556 |
| | 12. Clear and Cloud-Free Lines-of-Sight from Aircraft | 563 |
| | 13. CSSM—Cloud Scene Simulation Model | 511 |
| | 14. CRRESPRO—Combined Radiation and Release Effects Satellite Proton Flux Model | 514 |
| | 15. CRRESRAD—Combined Radiation and Release Effects Satellite Space Radiation Model | 515 |
| | 16. DATSAV2 Aircraft | 536 |
| | 17. DATSAV2 Rocketsonde | 534 |
| | 18. DATSAV2 Satellite | 533 |
| | 19. DATSAV2 Surface | 531 |

| <u>Service or Agency</u> | <u>Models and Databases in the Capabilities Survey Database</u> | <u>Model/DB No.</u> |
|---------------------------|--|---------------------|
| Air Force: (continued) | 20. DATSAV2 Upper Air | 535 |
| | 21. Drop-Size Distribution Associated with Intense Rainfall | 559 |
| | 22. Eighth Mesh Surface Temperature Analysis | 547 |
| | 23. EOTDA-Electro-Optical Tactical Decision Aid | 501 |
| | 24. Estimating Probabilities of Cloud-Free Fields-of-View from Earth Through the Atmosphere | 562 |
| | 25. FASCOD3 | 505 |
| | 26. High Resolution Analysis | 546 |
| | 27. High Resolution Cloud Prognosis | 524 |
| | 28. HIRAS/GSM-High Resolution Analysis System/Global Spectral Model | 525 |
| | 29. IAPM-Improved Aurora Precipitation Model | 516 |
| | 30. Interplanetary Shock Model | 517 |
| | 31. JAD-Jacchia Atmospheric Density Model | 554 |
| | 32. Lightning | 540 |
| | 33. Magnetospheric Specification and Forecast | 518 |
| | 34. Military Standard 210C, Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment (MIL-STD-201C) | 560 |
| | 35. MODTRAN3 | 506 |
| | 36. MOSART-Moderate Spectral Atmospheric Radiance and Transmittance | 507 |
| | 37. NOWS-Night Vision Goggle Operations | 502 |
| | 38. NOWS Weather Software Database | 504 |
| | 39. PIBAL | 537 |
| | 40. PLEXUS | 513 |
| | 41. Probability-of-Cloud Statistics (P Cloud S) | 566 |
| | 42. RTNEPH-Real-Time Nephanalysis | 526 |
| | 43. RTNEPH 6-Month (stored in 6-month increments) | 541 |
| | 44. RTNEPH Histogram | 542 |
| | 45. RTNEPH-LMHT/A Hemispheric | 543 |
| | 46. Radiosonde | 539 |

| <u>Service or Agency</u> | <u>Models and Databases in the Capabilities Survey Database</u> | <u>Model/DB No.</u> |
|---------------------------|---|---------------------|
| Air Force: (continued) | 47. RWM—Relocatable Window Model | 527 |
| | 48. SAMM—SHARC and MODTRAN Merged | 509 |
| | 49. SESFS—Space Environmental Specification and Forecast System | 555 |
| | 50. SHARC—Strategic High Altitude Radiance Code | 508 |
| | 51. SNODEP—Snow Depth | 528 |
| | 52. Snow Depth Climatology | 551 |
| | 53. Solar Flare Forecast Model | 520 |
| | 54. Solar Wind Transport Model | 519 |
| | 55. Summary of the Day | 532 |
| | 56. Surface Temperature Model—SFCTMP | 529 |
| | 57. Synthetic 3-D Atmospheric Temperature | 510 |
| | 58. TRONEW Cloud Model—New Tropical Cloud Model | 530 |
| | 59. Universal Methods for Estimating Probabilities of Cloud-Free Lines-of-Sight Through the Atmosphere | 561 |
| | 60. Upper-Air Window Analysis | 549 |
| | 61. Vertical Velocity Analysis | 550 |
| | 62. Winds Aloft | 538 |

3. ANALYSIS

This section describes the approach taken to analyze the data acquired during the Capabilities Survey, and describes why the approach was taken. The layout of the data presentation and the results derived from analyzing the data are discussed. The analysis covers all significant responses to the Capabilities Questionnaire and provides the principal quantitative basis for the recommendations proposed in Section 4.

3.1 APPROACH

The technical analysis of any data set has to consider the preferences, biases, and viewpoints of the customer who is expected to use the results of the analysis. In the case of this survey effort, the Survey Team, based on the collective experience of its members, perceived two **communities of customers** that might be interested in the results of the Requirements Survey and the Capabilities Survey:

- The M&S community in each of the Military Services
- The environmental modeling and database community in each of the Military Services

As mentioned in the introduction of this document, the Survey Team's perception prior to conducting this survey effort was that the two communities of customers had infrequent interaction with each other. The current survey effort has generally corroborated that perception. The Requirements Survey interviews, in particular, indicated that each customer community lacked knowledge, in some cases fundamental knowledge, of the technical requirements and capabilities of the other customer community. Consequently, the Survey Team attempted to overcome this lack of knowledge by identifying a set of technical issues that both customer groups might use to establish a common baseline for further discussion, interaction, and, perhaps, joint partnership. Such interaction might, in turn, lead to improvement in the realism of the Military Services M&S efforts, as well as providing the Services priorities for research and development of atmospheric and near-space-environment databases and models. To communicate these technical issues, the Survey Team attempted to construct both the Requirements Questionnaire and the Capabilities Questionnaire, the database, and the analysis framework in a manner that was understandable to both communities of customers.

Within each of these two communities of customers, the Survey Team perceived two **levels of management** that might have an interest in the survey results:

- The staff headquarters level where broad, aggregated information is used to make programmatic decisions
- The individual project manager level where much more specific information is required for decisions

Using the top-down approach, the Survey Team organized both questionnaires and associated databases such that analyses were made from the perspective of a Military Service headquarters representative, as well as from the viewpoint of an individual project manager within that service. Typically, the Service headquarters M&S representative and the environmental modeling and database representative were interested in “big picture” programmatic issues. For example, a question from the Service headquarters M&S representative might have been “Which of my service’s models require environmental data input?” or, “What are the critical environmental factors or data types for my service’s models?” On the other hand, the Service headquarters environmental modeling and database representative might have asked “On what environmental data types should I focus my research to support the M&S community?” At the individual project manager level, technical questions or issues were more narrowly focused. An M&S community project manager might have asked “What is available to satisfy my simulator’s requirement for cloud data?”, while the environmental modeling and database community project manager might have asked “Who in the M&S community needs the cloud data that I am archiving?”

The analysis made by the Survey Team, therefore, is an initial step in identifying technical issues. It seeks to begin the process of communicating such technical issues to two diverse service communities for their consideration. Results, findings, and recommendations from the Requirements Survey have been provided in the Survey Team’s requirements document (Piwowar et al., 1996) to assist in this communication process. With an analysis of the atmospheric and near-space-environment database and modeling capabilities highlighted in this catalog, the Survey Team continues the process of communicating technical issues for consideration by the DMSO and the Military Services.

3.2 DATA PRESENTATION

For this capabilities document, the display of data in Subsection 3.3 is generally organized according to the sequence of questions contained in the Capabilities Questionnaire (Appendix A). Displayed in the

document are analyses of responses for each question in the Capabilities Questionnaire for the entire set of 152 questionnaires in the database. The Survey Team has taken this approach to summarize the overall response to the Capabilities Survey. Graphical and tabular presentations are provided to aid the reader in understanding the responses and, therefore, the capabilities of the Military Services environmental database and modeling community.

3.3 RESULTS

Substantial amounts of data have been received from the 152 capabilities questionnaires. The answers provided by these questionnaires have been verified with the technical points of contact to ensure the credibility of the database and, hence, the basis for the Survey Team's capabilities analysis. All 152 questionnaires have been quality controlled for applicability to the Capabilities Survey and completeness in terms of answers to the questions and informational items in the technical section of the questionnaire.

3.3.1 Functional Use and Hierarchy

The analysis begins with a table containing the number of responses to questions and informational items in the Capabilities Questionnaire that inquire about the functional use and hierarchical categories associated with the model or database. Some returned questionnaires indicated more than one choice for either the DMSO functional area or hierarchical level categories, or both. Only the responses from each questionnaire that indicated the "predominant category" for both the DMSO functional area and hierarchical level categories have been counted. The count is shown in Table 2.

The data in Table 2 indicate that there are three dominant functional areas for the databases and models surveyed. Of the 152 databases and models surveyed, 148, or 97 percent, are associated with Research and Development, Analysis, and Military Operations. **One result gleaned from this table is the lack of databases and models identified as supporting the other three DMSO functional areas (i.e., Test and Evaluation, Production and Logistics, and Education and Training). Another unexpected result is the lack of supporting environmental databases and models for the Campaign-level models and simulations.**

Table 2. Databases and Models Categorized by DMSO Functional Area and Hierarchical Level

| Model/ Simulation Hierarchical Level | DMSO Functional Areas | | | | | | Totals |
|---|-------------------------------------|---------------------------|----------|--------------------------------|------------------------|------------------------------|--------|
| | Research and Develop- ment | Test and Evaluation | Analysis | Production and Logistics | Military Operations | Education and Training | |
| Campaign | | | | | 1 | | 1 |
| Mission | 2 | | 12 | | 5 | | 19 |
| Many-on- Many / Few-on- Few | | 1 | 10 | | 1 | | 12 |
| 1-on-1 | 33 | | 21 | | 25 | | 79 |
| Engineering | 13 | 1 | 4 | | 3 | | 21 |
| Not Indicated | 6 | | 4 | | 8 | 2 | 20 |
| Totals | 54 | 2 | 51 | 0 | 43 | 2 | 152 |

3.3.2 Components of Military Simulations

In Section 5.3 of the requirements document (Piwowar et al., 1996) the six major components of military simulations were discussed. From that information, the 152 environmental models and databases making up the survey were grouped into three of those major components: environmental databases, environmental models, and environmental effects models. The distribution of the environmental models and databases in the three groups is shown in Figure 3. Appendix G provides a listing of the databases and models that are grouped into each of the three major components of the military simulations.

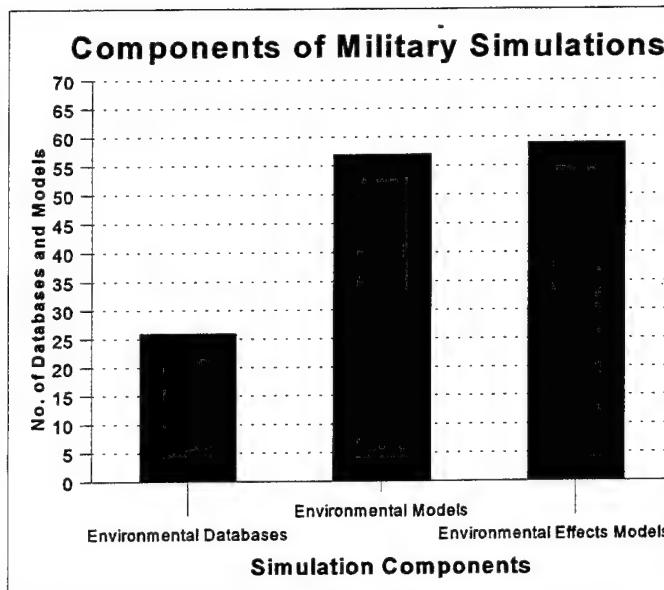


Figure 3. Surveyed environmental databases and models grouped as components of military simulations.

3.3.3 Types of Applications Supported

In the Capabilities Questionnaire the respondents were asked to identify the types of applications supported by the model or database. The four choices for answers were sensor acquisition of targets, mobility of platforms and forces, decision aids for command and control authority, and other. Respondents were permitted to choose more than one answer. Figure 4 depicts nearly an even split between decision aids for command and control authority and sensor acquisition of targets; together they account for 92 percent of the responses.

3.3.4 Military Object Families Supported

The next item requested the respondents to identify missions, forces, platforms, weapon systems, communications systems, sensors, and targets to which their environmental capabilities are applied. These seven categories of military components can also be termed “military object families.” Figure 5 depicts the number of models and databases applied to each military object family. The platforms peak stands out, followed by applications to sensors, missions, and weapons.

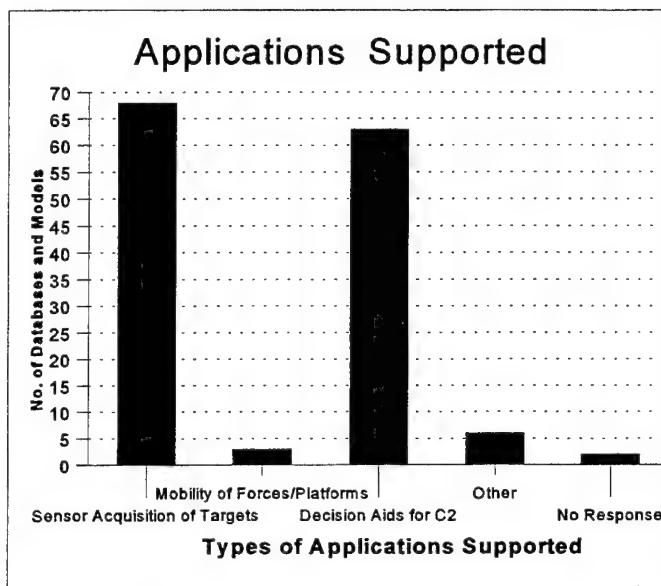


Figure 4. Applications supported by the environmental databases and models surveyed.

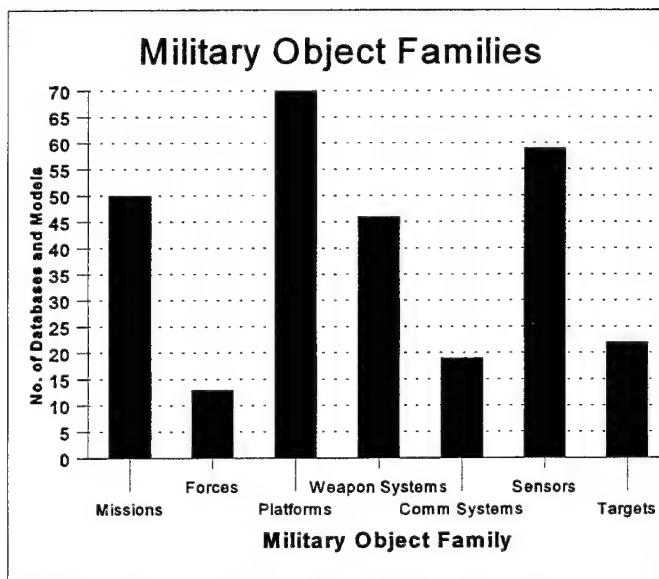


Figure 5. Military object families included in the environmental databases and models surveyed.

3.3.5 Domains

The next item in the Capabilities Questionnaire inquired about the model or database domains: horizontal surface, vertical, and time. The results are described in the following subsections.

3.3.5.1 Horizontal surface domain

Nine possible answers were provided in the questionnaire for the respondent. The respondent was requested to select as many as were applicable but to indicate the model or database's predominant horizontal domain as well. Figure 6 depicts the predominant domain and other applicable domains for the various models and databases. Note that global and global land domains account for 78 percent (55 percent and 23 percent, respectively) of the responses in this survey set. Only 9 of the 152 models and databases have secondary domains.

3.3.5.2 Vertical domain

For the applicable and predominant vertical domains of the models and databases, seven possible answers were provided as choices. Figure 7 depicts the response to those choices. The atmosphere dominates the survey dataset with 79 percent of the predominant domain and 51 percent of the secondary domain.

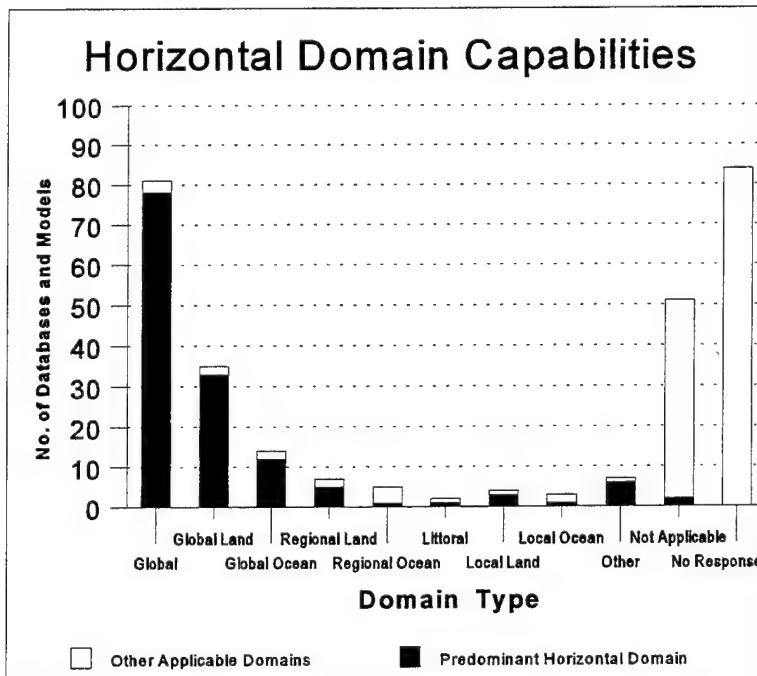


Figure 6. Horizontal domain capabilities associated with the environmental models and databases surveyed.

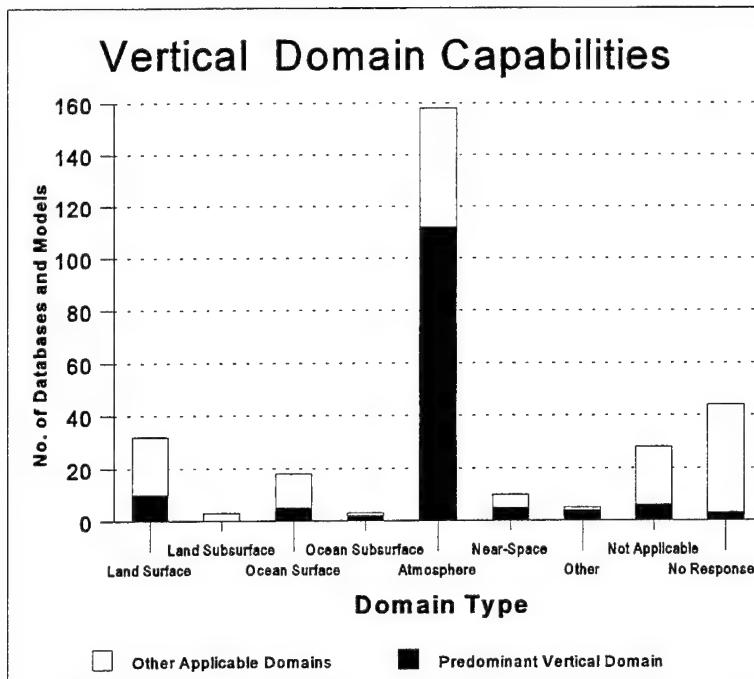


Figure 7. Vertical domain capabilities associated with the environmental models and databases surveyed.

3.3.5.3 Time domain

Respondents were also asked to provide information on the time domain for their model or database, both in terms of the typical time period being represented and the maximum time period that can be represented. Figure 8 presents the results of the responses. The peak at hours accounts for 47 percent of the surveyed environmental capabilities with typical time scales, and the two surrounding secondary peaks at minutes and days account for 40 percent. Note that time is not applicable to 33 percent of the surveyed models and databases.

3.3.6 Current Capabilities

Responses in this section refer to capabilities that are satisfied today. Respondents were queried about the grid used in the model or database, the types of environmental data and effects provided, and other technical information.

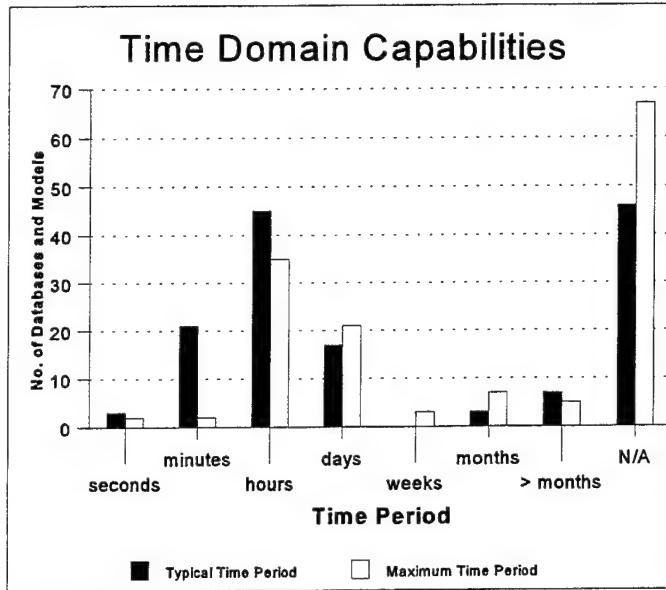


Figure 8. Time domain capabilities associated with the environmental models and databases surveyed.

3.3.6.1 Grids

A question was asked about the typical grid used by the model or database. Figure 9 depicts the results of the responses. Approximately 30 percent of the models and databases used Cartesian or latitude-longitude types of grids.

A question was also asked about the typical map projection used. Figure 10 indicates that nearly half of the models and databases surveyed did not use a map projection. Mercator projections were used by 44 percent of the environmental capabilities that are represented on a map projection.

3.3.6.2 Environmental data

The questionnaire listed 26 atmospheric data types and 23 near-space-environment data types for the respondents to describe the output of their model or the contents of their database, that is, the environmental capabilities of either the model or database. Respondents were requested to indicate whether their model or database **currently outputs** these data types or has the **potential** to provide them. For those data types currently being used, respondents were also asked to indicate the fidelity of each data type. In addition to the capability of providing atmospheric and near-space-environment data, respondents were also asked

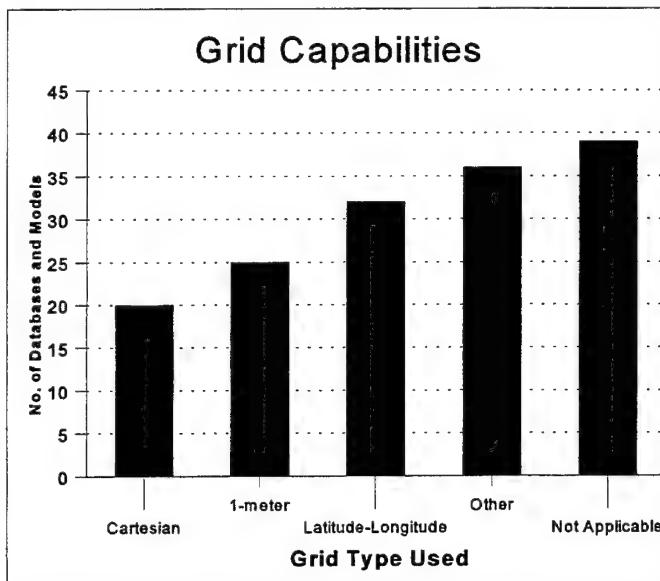


Figure 9. Grid types used in the environmental databases and models surveyed.

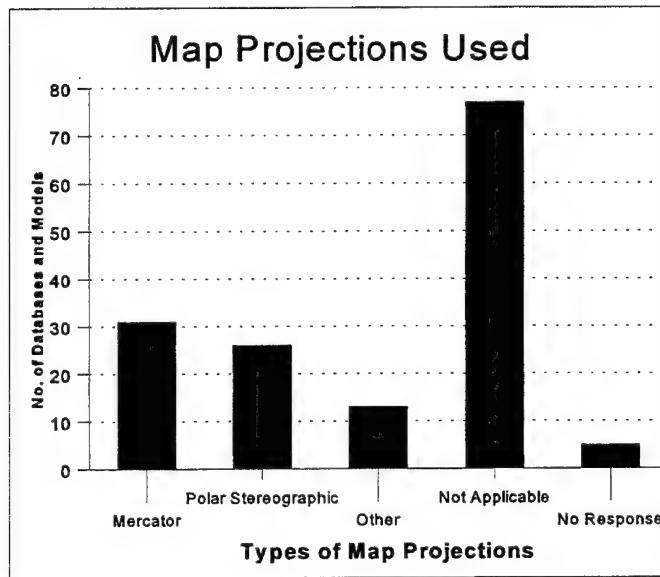


Figure 10. Types of map projections used in the environmental databases and models surveyed.

to identify any other environmental data types or environmental effects (e.g., those associated with terrain or the ocean) available from their model or database. In the following categories, details are provided on the responses for (1) atmospheric data, (2) near-space-environment data, and (3) environmental data.

Atmospheric data capabilities. This subsection describes the atmospheric data fidelity capabilities of the models and databases surveyed. The Capabilities Questionnaire was primarily focused on the quantitative aspects of the fidelity capabilities: respondents were queried about the types of atmospheric data provided and the spatial and temporal resolution capabilities for each data type.

Figure 11 depicts the total number of models and databases surveyed that were identified to have current (115) and potential (116) capabilities of providing any of the 26 atmospheric data types listed in the next category. Of the models and databases surveyed 76 percent (115 of 152) provide atmospheric data, and only one additional model has the potential to provide atmospheric data.

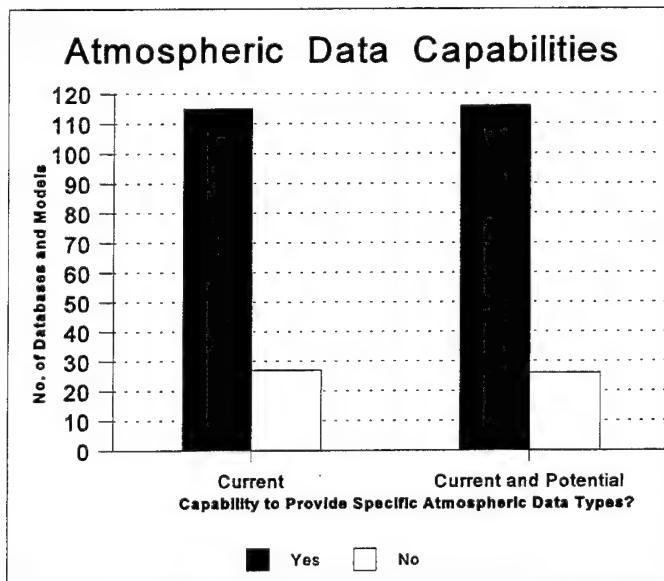


Figure 11. The number of environmental databases and models surveyed that have a current, or current and potential, capability to provide at least one of the specific atmospheric data types listed in the text.

Atmospheric data types. Attachment 1 of the Capabilities Questionnaire (Appendix A) contains an expanded list of the 26 atmospheric data types, as well as items on fidelity and potential capabilities. Each of the data types is cross-referenced in Appendix H to the models and databases described in Appendix F and appears in the following summary list.

- | | |
|----------------------------|---|
| 1. Aerosols | 14. Transmissivity |
| 2. Atmospheric Electricity | 15. Visibility |
| 3. Clouds | 16. Wind |
| 4. Dew Point | 17. Wind Features (e.g., hurricanes) |
| 5. Fog | 18. Radiative Features (e.g., sky brightness) |
| 6. Humidity | 19. Smoke |
| 7. Mixing Ratio | 20. Chaff Dispersion |
| 8. Precipitation | 21. Combat-generated Dust |
| 9. Refractivity | 22. Contrail Formation and Dispersion |
| 10. Sea Level Pressure | 23. Dispersal of Biological and Chemical Agents |
| 11. Static Stability | 24. Nonnuclear Munitions Effects |
| 12. Temperature | 25. Nuclear Weapons Detonation Effects |
| 13. Trace Gases | 26. Ship Exhaust Tracks |

Figure 12 depicts the number of capabilities that provide each atmospheric data type. **Note that data types 14 (transmissivity) and 3 (clouds) dominate the list of current capabilities, being provided by 25 and 24 models or databases, respectively.** Temperature, wind, and radiative features account for secondary peaks that are 60 percent or more of the primary peaks. Accounting for the models and databases that also have the potential to provide atmospheric data types by adding them to the current capabilities does not change the dominant peaks, as shown in Figure 12.

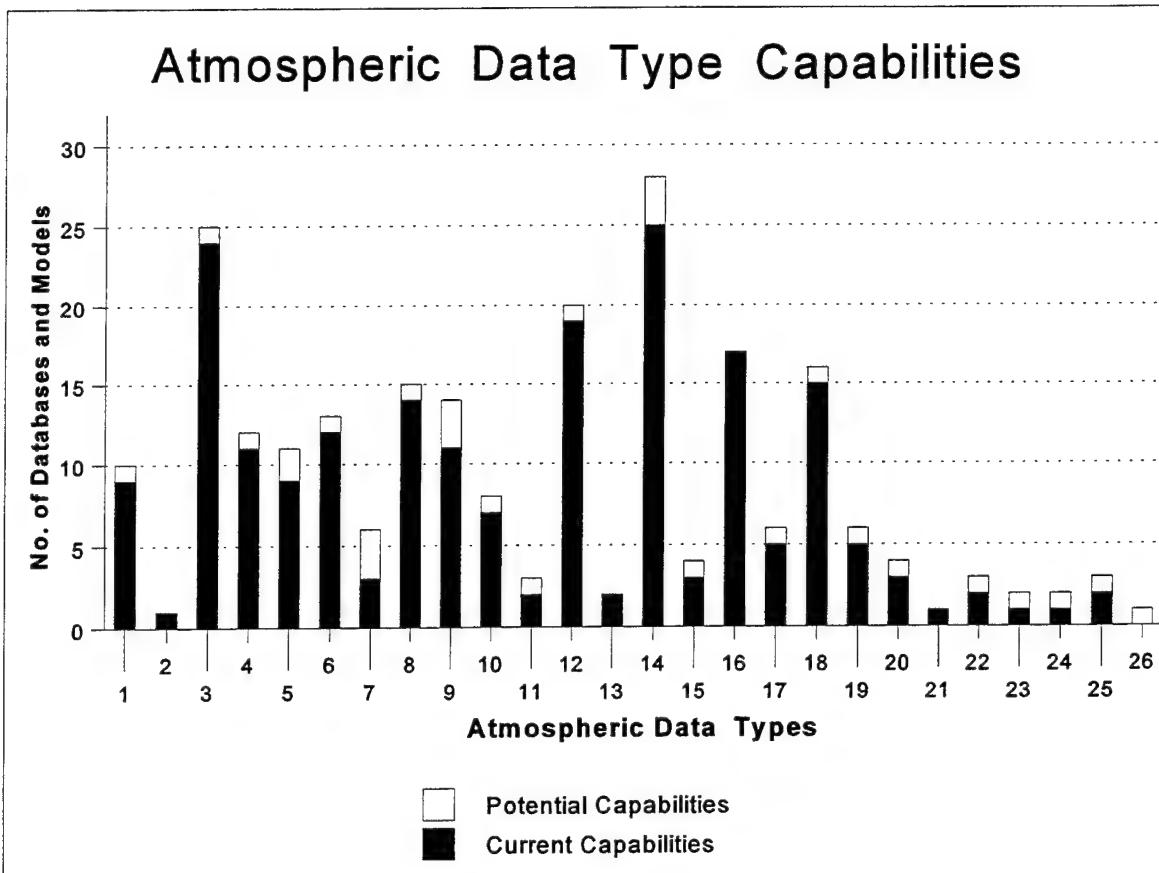


Figure 12. The number of environmental databases and models surveyed having a capability to provide a specific atmospheric data type. The 26 atmospheric data types are listed in the text.

Atmospheric data resolution capabilities. Along with choices about the specific atmospheric data types available from each model or simulation, respondents were also queried about the spatial and temporal resolution of each data type. Figures 13–16 depict the distributions of these resolution capabilities.

Of the 152 surveyed models and databases included in Figure 11, 81 currently provide atmospheric data at a specified fidelity. Respondents have identified at least one resolution capability for each of these models and databases, as shown in Figure 13 (which depicts space and temporal fidelity). Of these 81 models and databases, 58 have a single horizontal resolution capability and 7 have more than one, 48 have a single capability for vertical resolutions and 9 have more than one, and 51 have a single capability for time resolutions and 9 have more than one.

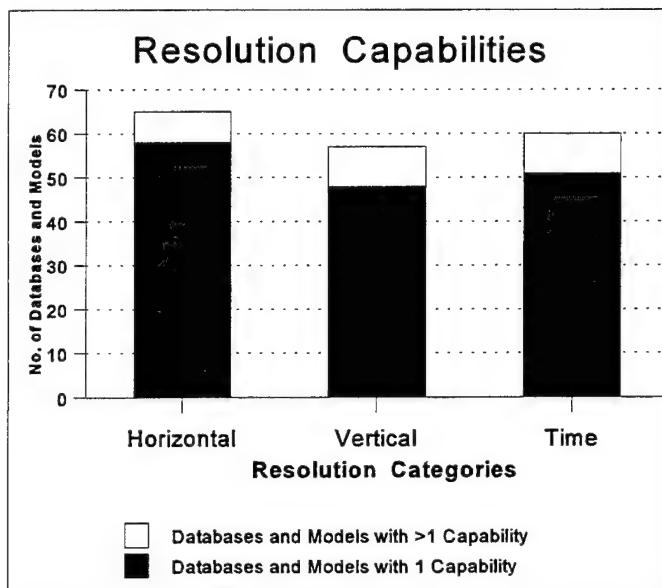


Figure 13. The number of databases and models surveyed having horizontal, vertical, and time resolution capabilities.

As shown in Figure 13, only 7 of the 65 models and databases that provide atmospheric data at specified horizontal resolutions have the capability to provide that data at more than one scale. The available horizontal scales cover a wide range, dominated by peaks at 1 m and 100 km, as shown in Figure 14.

Nine of the 57 databases and models with vertical resolution capabilities (Figure 13) have more than one capability. Of these nine databases and models, eight have two unique vertical capabilities and one has three; the vertical resolution capabilities total 66 and are shown in Figure 15. These capabilities cover a wide range, but those at 1 m dominate.

Nine of the 60 models and databases with a time resolution capability (Figure 13) have more than one capability; each of these nine has two unique capabilities. Time resolution capabilities therefore total 69, as shown in Figure 16. Similar to the available horizontal and vertical resolution scales, there is a wide range of time scales although no one time scale dominates.

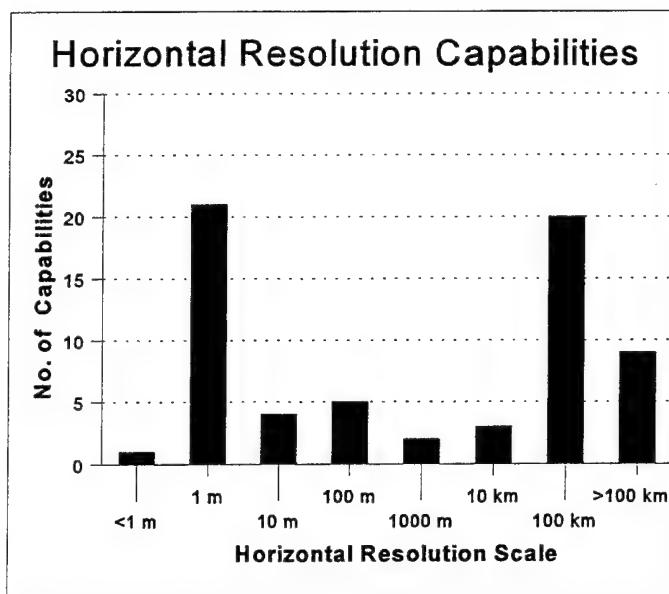


Figure 14. Horizontal resolution capabilities of the environmental databases and models surveyed.

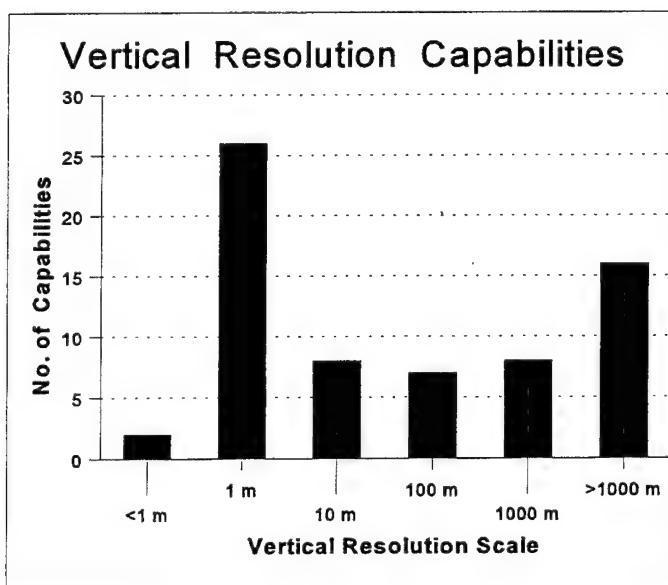


Figure 15. Vertical resolution capabilities of the environmental databases and models surveyed.

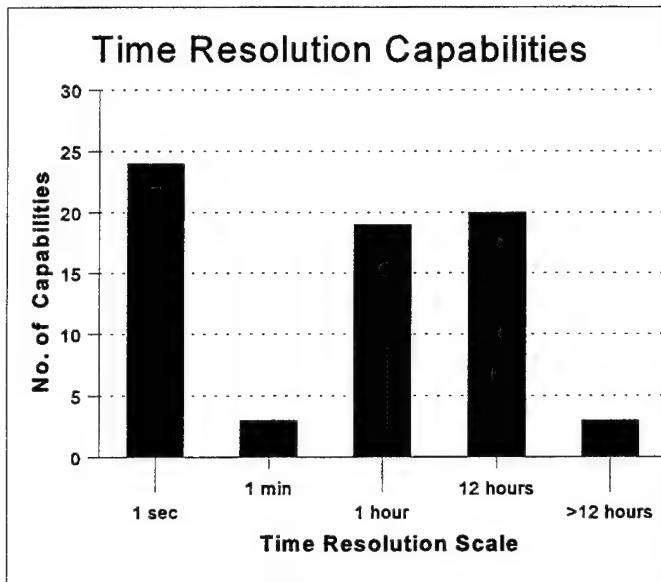


Figure 16. Time resolution capabilities for the environmental databases and models surveyed.

Atmospheric effects capabilities. Respondents were asked for information on the capability of providing specific atmospheric data types and at what resolution. The Capabilities Questionnaire also contained a request for information regarding the availability of atmospheric effects in each model and database. The items were expressed in terms of the atmospheric effects on military objects (i.e., forces, platforms, weapon systems, communications systems, and sensors), which are the same military objects identified in a previous item in the questionnaire and discussed briefly in Subsection 3.3.4. The responses from this earlier item provide a basic understanding of the types of military objects that use the atmospheric effects provided by each model or database.

Figure 17 depicts the results of the responses to the requests for information on atmospheric effects capabilities. For convenience, Figure 17 also includes the results shown in Figure 5. Clearly, capabilities to provide atmospheric effects on sensors dominate the set of models and databases in this survey.

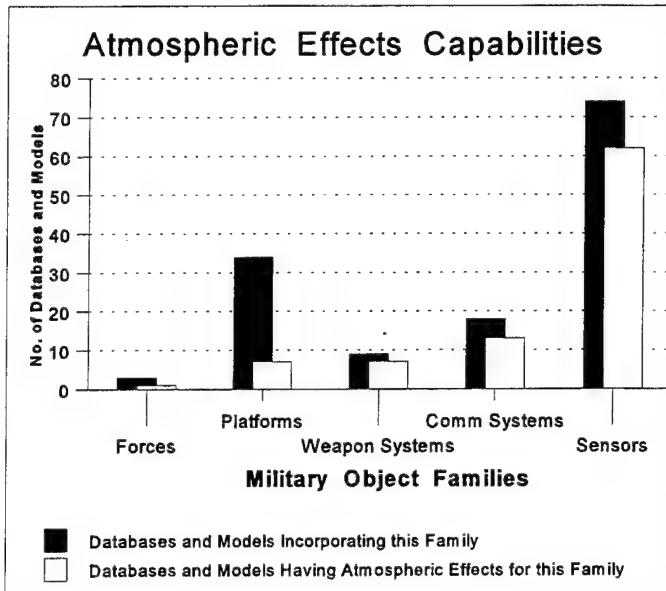


Figure 17. Databases and models surveyed incorporating a military object family and having atmospheric effects for that family.

Near-space data capabilities. The categories that follow describe the near space data fidelity capabilities for the models and databases surveyed. Similar to the atmospheric data portion, the Capabilities Questionnaire was primarily focused on the quantitative aspects of the fidelity capabilities available for the near space data. Respondents were queried about the types of near-space-environment data required and the spatial and temporal resolution capabilities for each data type.

Figure 18 depicts the number of models and databases surveyed that were identified to have current and potential capabilities to provide any type of near-space-environment data. Only 13 of the 152 surveyed models and databases have current capabilities; none have the potential capability to provide near space data. Hence, the side-by-side bar graphs in Figure 18 are the same.

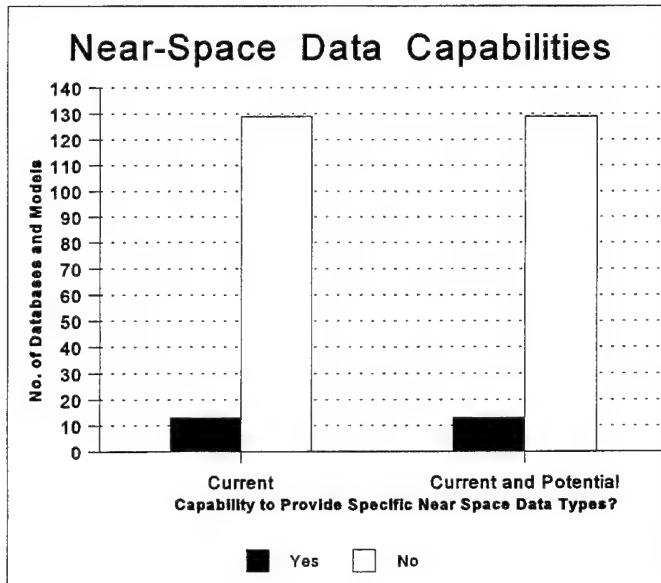


Figure 18. The number of environmental databases and models surveyed that have a current, or current and potential, capability to provide at least one of the specific near space data types listed in the text.

Near space data types. Attachment 2 of the Capabilities Questionnaire (Appendix A) contains an expanded list of the 23 near space data types, as well as informational items on fidelity and potential capabilities. Each of the data types is cross-referenced in Appendix I to the models and databases described in Appendix F and appears in the following summary list.

1. Auroral Particle Precipitation
2. Cosmic Rays
3. Diffuse Zodiacal Emission
4. Geomagnetic Field
5. Interplanetary Medium
6. Low Energy Plasma Environment
7. Lunar Parameters
8. Meteoroids and Debris
9. Neutral Environment
10. Radio Background Noise
11. Solar Parameters
12. Star and Planetary Positions
13. Energetic Particles
14. Geomagnetic Storms
15. Gravity Waves
16. Noctilucent Clouds
17. Polar Cap Absorption
18. Sporadic E
19. Sudden Ionospheric Storms
20. Dispersal of Flares
21. Formation and Dispersal of Rocket Exhaust
22. Munitions Effects (Nonnuclear)
23. Nuclear Weapons Detonation Effects

For the 13 models and databases having the capability to provide the near space data types listed, Figure 19 depicts the number of unique capabilities to provide each near-space-environment data type. **Near space data type 11, solar parameters** (i.e., **solar position, solar radiative flux, sunspot activity, and solar index**), is provided most; followed by data types **14 and 1, geomagnetic storms and auroral particle precipitation, respectively**. Caution must be exercised, however, in interpreting such a small data sample.

Near space data resolution capabilities. Respondents to the Capabilities Questionnaire identified resolution capabilities for 9 of the 13 models and databases that can provide near-space-environment data. **All had horizontal scales, eight had vertical scales, and six had time scales, but only time scales lend themselves to analysis.** Figure 20 depicts the distribution of the time resolution capabilities for near-space-environment data associated with the six models and databases.

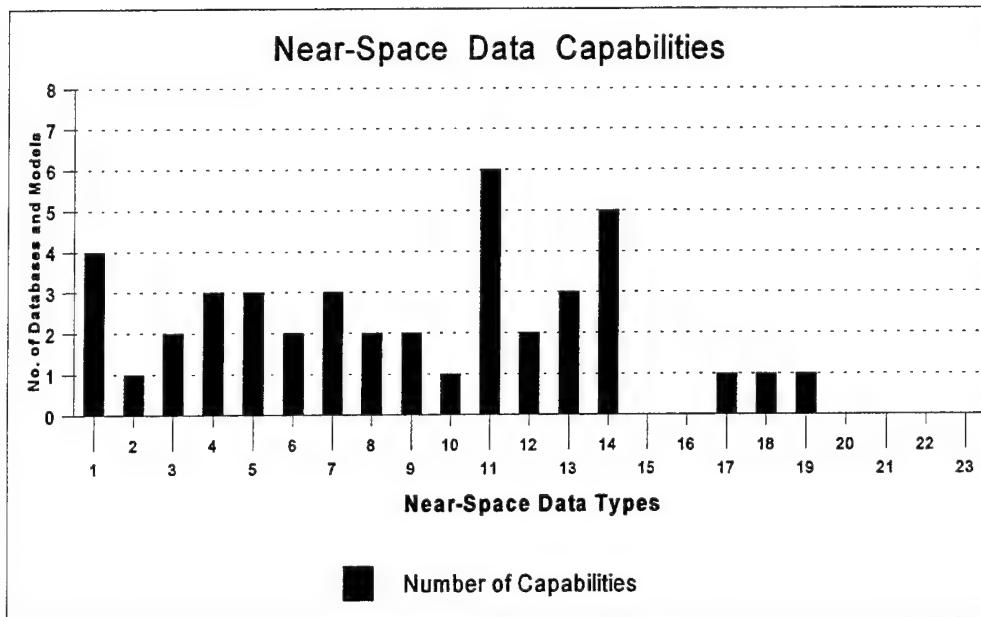


Figure 19. The number of environmental databases and models having capabilities for near space data types listed in the text.

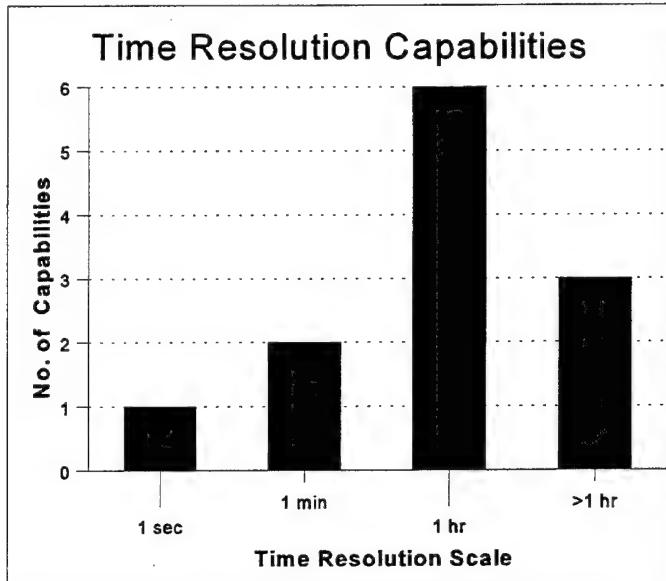


Figure 20. The number of time resolution scale capabilities associated with the databases and models having near space data types.

Near-space-environment effects capabilities. Similar to the section on atmospheric effects, the respondents were asked for information on the capabilities of the databases and models. Again, the items were expressed in terms of the effects of the near space environment on a variety of military objects (i.e., forces, platforms, weapon systems, communications systems, and sensors). These five military object families are discussed briefly in Subsection 3.3.4. Figure 21 depicts the results of the responses. For convenience, Figure 21 includes the results shown in Figure 5. Clearly, the responses indicate that a small number of databases and models provide near-space-environment effects.

Other environmental data and effects capabilities. The Capabilities Questionnaire included a request for information about capabilities for any type of environmental data and effects other than those associated with the atmosphere and near space environment. Responses to this query were received from only 11 of the 152 model and database questionnaires. The results are shown in Figure 22.

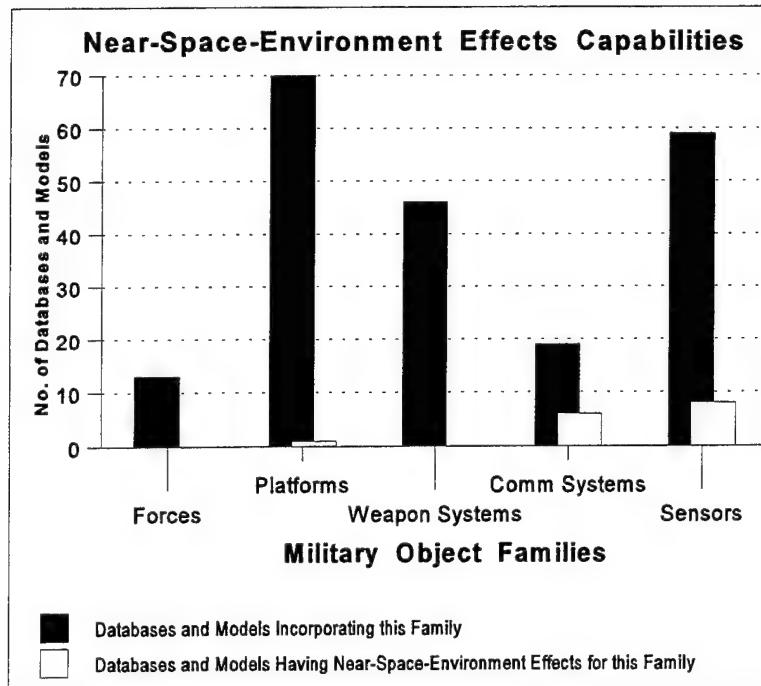


Figure 21. Databases and models surveyed incorporating a military object family and having near-space-environment effects for that family.

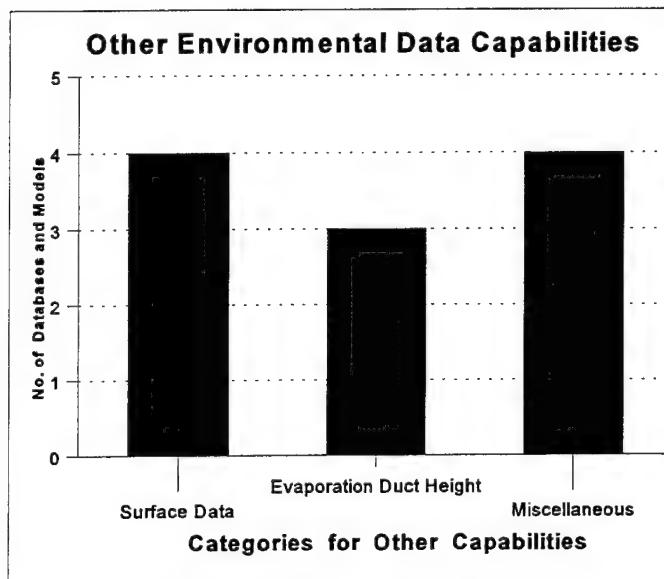


Figure 22. The number of databases and models having capabilities for environmental data types other than those atmospheric and near-space-environment data types listed in the text.

3.3.6.3 Other technical capabilities

Besides inquiries about the primary technical focus of the survey effort (i.e., capabilities to provide atmospheric and near-space-environment data and effects data), the Capabilities Questionnaire included questions and informational items about other capabilities of each model or database. Results associated with these other capabilities—such as scalability; compatibility; accessibility; verification, validation, and accreditation; and currency—are described below.

- (1) **Scalability capabilities.** A question was posed about a capability for scalability, that is, the capability of the database or model to increase or decrease its spatial or time resolution. As indicated in Figure 23, 120 responses to this question were received. Only 12 of these 152 models and databases have scalability capabilities.
- (2) **Compatibility capabilities.** A series of questions was asked about the software and hardware associated with each model and simulation.

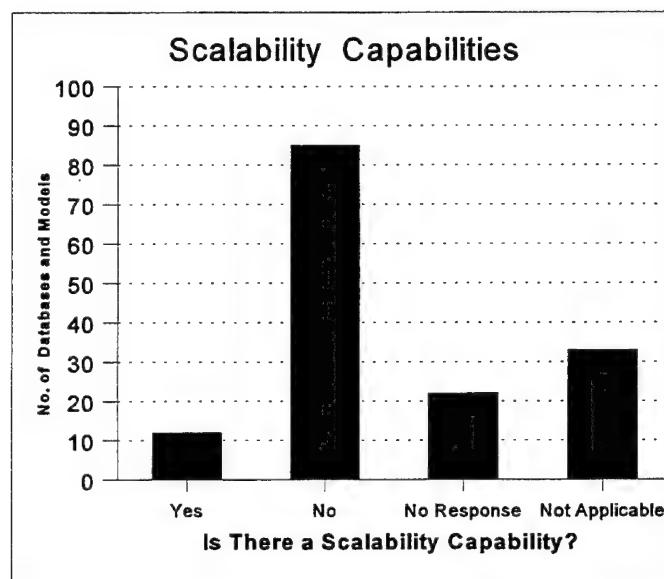


Figure 23. The number of databases and models surveyed having a scalability capability, i.e., the capability to increase or decrease time or spatial resolution.

Questions were posed about the operating system, programming languages, database management system, and any near-term changes to these three components. Figures 24–27 depict the response results.

The GFMPL/TESS (Geophysical Fleet Mission Programming Library/Tactical Environmental Support System) slightly dominates the operating systems presented in Figure 24, although this naval system is used by less than one-quarter of the surveyed models and databases. FORTRAN is clearly the preferred programming language, as shown in Figure 25. For the database management systems, however, there is no clear preference, as shown in Figure 26. Of the models and databases surveyed 19 percent will have near-term (i.e., by FY-97) changes, as shown in Figure 27.

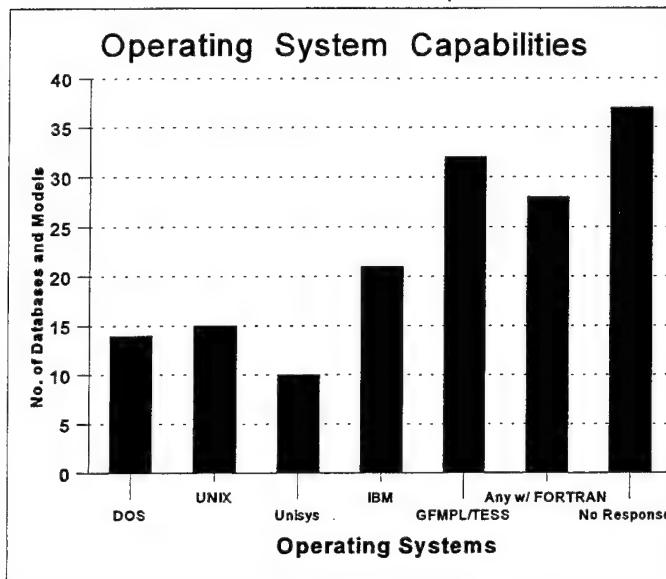


Figure 24. Operating system capabilities for the databases and models surveyed.

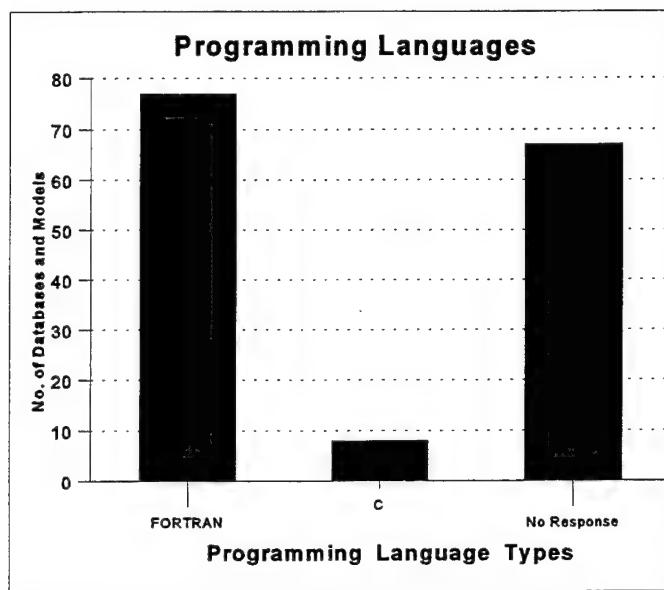


Figure 25. Preferred programming languages for the databases and models surveyed.

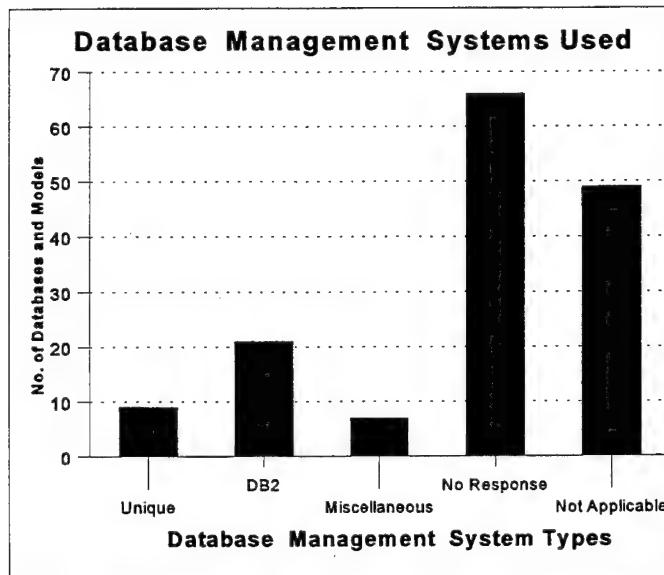


Figure 26. Preferred database management systems for the databases and models surveyed.

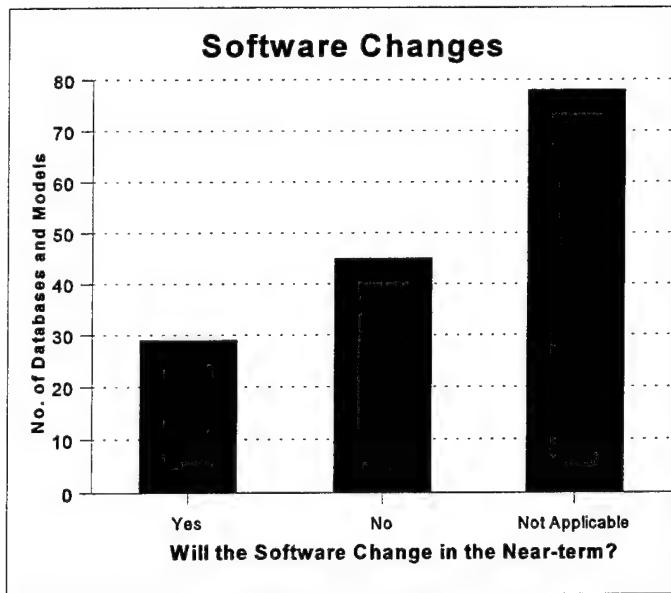


Figure 27. The number of databases and models surveyed that plan to have near-term software changes incorporated.

Questions were also asked about hardware capabilities for the models and simulations in terms of host hardware, transportability, and data media. Figures 28, 29, and 30 depict the response results.

As shown in Figure 28, generally computer workstations, personal computers, and Unisys systems are preferred as host hardware for the databases and models surveyed. Of the 74 responses for the transportability capabilities question, Figure 29 illustrates that 29 models and databases can operate on a host hardware configuration. As for data media, Figure 30 indicates that nine-track tapes, CD-ROMs, and floppy disks are predominantly used.

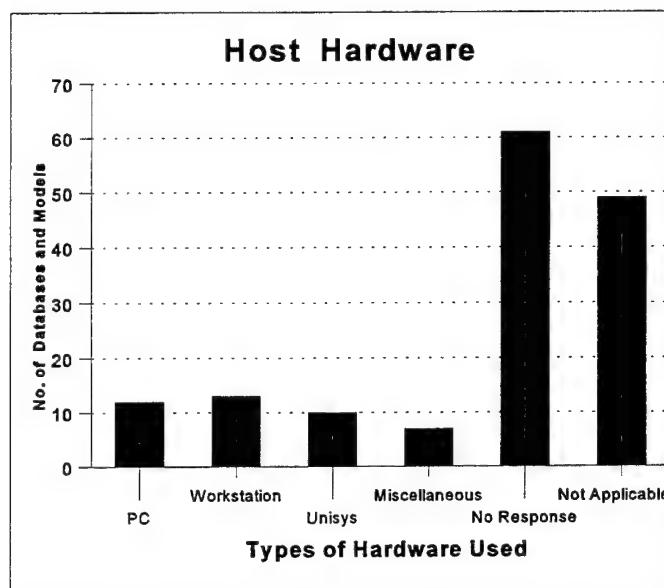


Figure 28. Types of host hardware used for the databases and models surveyed.

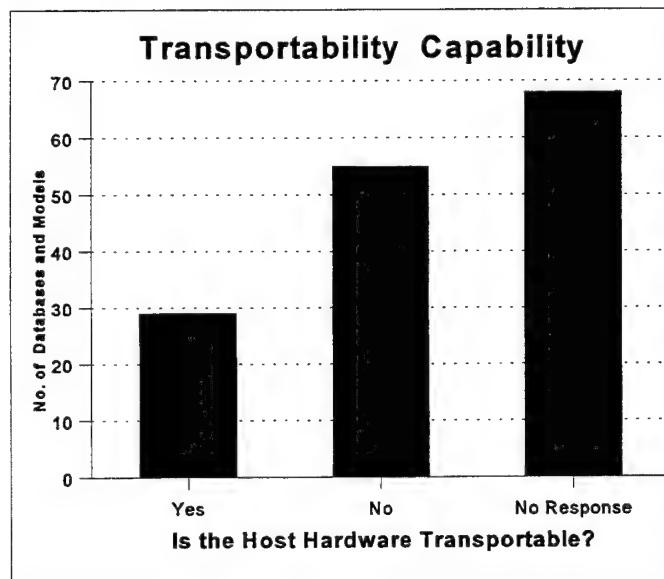


Figure 29. The number of databases and models surveyed that have transportable host hardware.

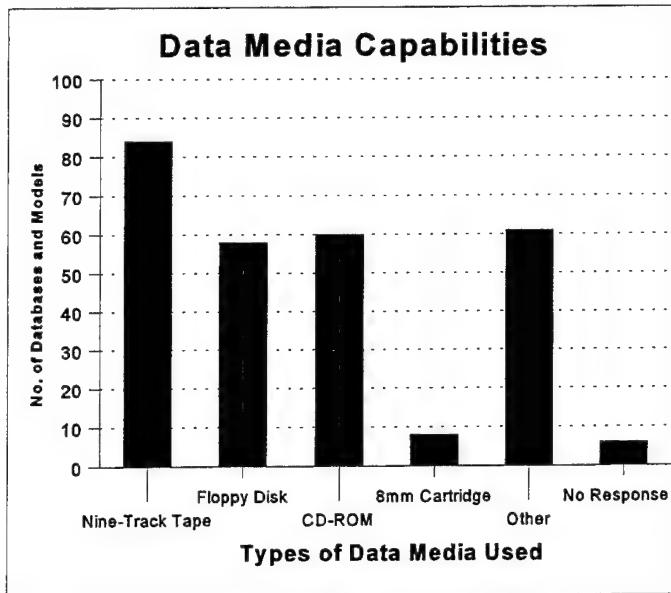


Figure 30. The types of data media used for the databases and models surveyed.

(3) **Accessibility capabilities.** Two questions were posed about accessibility capabilities associated with each model and database. The first question was concerned with the maximum information security level of the environmental data. As shown in Figure 31, 53 percent of the responses indicated that environmental data are not provided above the unclassified level. The second question was related to accessibility of the databases and models via external communications. As shown in Figure 32, unclassified phone lines are clearly the dominant external communications capability. On the other hand, about 37 percent of the databases and models do not have any type of external connectivity.

(4) **Verification, validation, and accreditation capabilities.** Questions were posed about capabilities for verification, validation, and accreditation (VV&A) of the atmospheric and near space models and databases being developed. Figure 33 provides the results of the responses to these questions. Note that in general while a slight majority of models and databases have been verified, most of them are neither formally validated nor formally accredited. (While VV&A deals with acceptability of a given model for a specified use, data that are input to the model undergo a similar process called verification, validation, and certification—VV&C.)

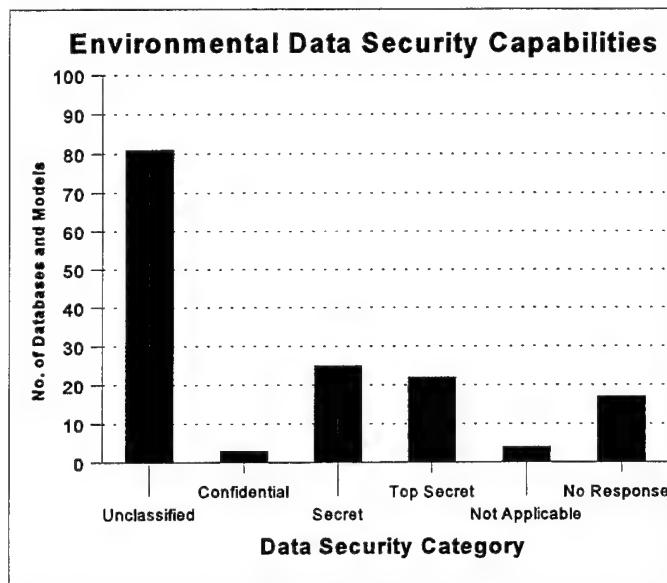


Figure 31. The maximum information security level for each of the databases and models surveyed.

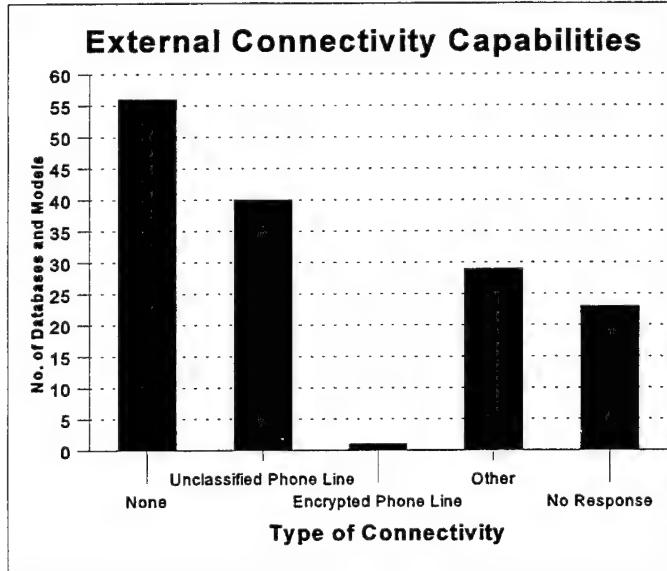


Figure 32. The types of external connectivity capabilities used for the databases and models surveyed.

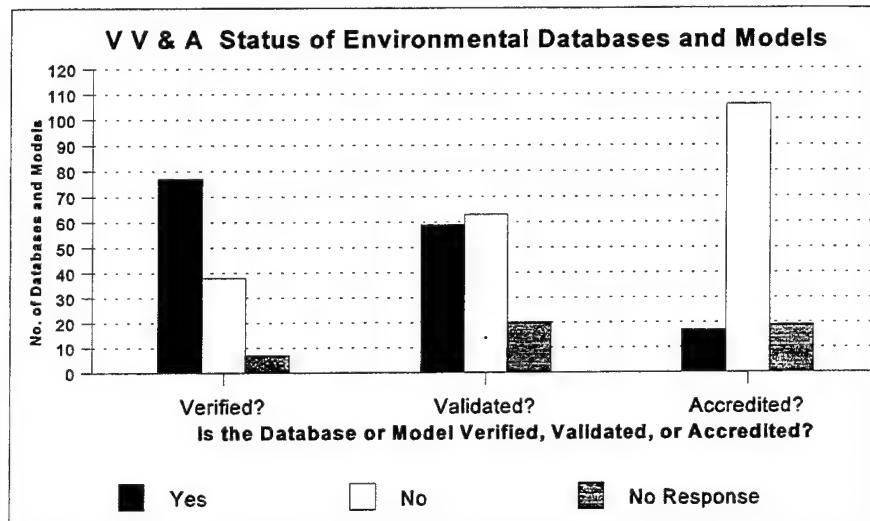


Figure 33. The number of databases and models surveyed that have been verified, validated, or accredited.

(5) **Currency of data capabilities.** A question was asked about the model or database use of reasonably current atmospheric and near space data. As shown in Figure 34, 70 percent of the models and databases use current data as input.

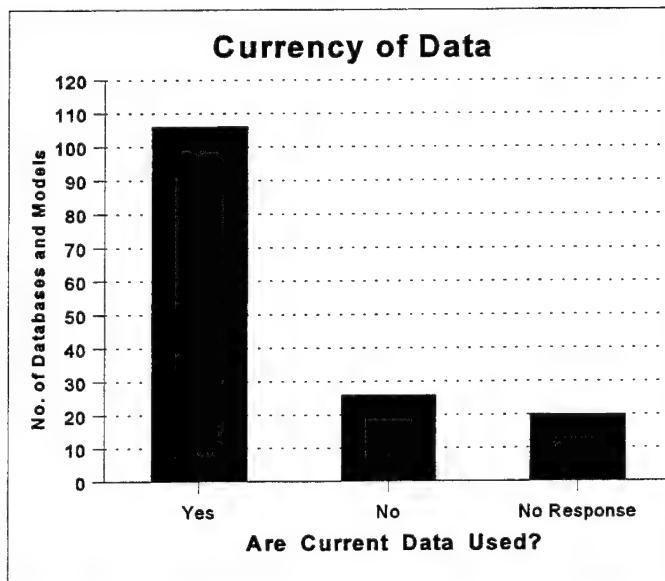


Figure 34. The number of databases and models surveyed that use reasonably current data as input.

4. SUMMARY

The purpose of the Capabilities Survey was to develop a baseline of the Military Services atmospheric and near-space-environment models and databases and environmental effects models and databases. This report, the second of three complementary reports, describes the results of the analysis of the data obtained from 152 capabilities survey questionnaires. The more significant results are briefly summarized as findings, which lead to the authors' conclusions and recommendations.

4.1 FINDINGS

All major atmospheric data and atmospheric effects are available, some in greater quantity and better quality (higher fidelity) than others. The two specific atmospheric capabilities most frequently available are transmissivity and clouds, which are available from 24 unique models and databases. Other frequently available data are temperature, wind, and radiative features, each of which is available from more than 12 models and databases. These capabilities are not redundant; the data are available across a wide range of fidelity in time and space. More than 50 percent of the models and databases provide atmospheric effects on sensors, and 25 percent of the models and databases provide atmospheric effects on military platforms. On the other hand, not even 10 percent of the surveyed models and databases have near-space-environment data capabilities.

Among the more interesting findings relating to modeling, the Survey Team observed that in the M&S hierarchy the Campaign-level models and simulations lack explicit support from the surveyed environmental models and databases. In contrast, a concentration of support is available to the one-on-one M&S hierarchical level from more than 50 percent of the environmental models and databases surveyed. Also, the vast majority (97 percent) of the surveyed models and databases support three (of six) DMSO functional areas: Research and Development, Analysis, and Military Operations. This evidence implies that the remaining functional areas (Test and Evaluation, Production and Logistics, and Education and Training) lack explicit support from the environmental models and databases surveyed.

4.2 CONCLUSIONS AND RECOMMENDATIONS

As shown in this report, the Military Services maintain a large number of unique atmospheric and atmospheric effects models and databases, and a much smaller number of near-space-environment capabilities. The Survey Team has accomplished its purpose of establishing a baseline for these capabilities, as determined from a top-down view, and of cataloging them in considerable detail. This baseline of military

environmental models and databases was compiled into the catalog shown in Appendix F, a catalog that will remain incomplete until it includes the environmental models and databases developed and maintained by civilian agencies. A follow-on survey should be conducted to augment, update, and refine the data already collected and analyzed. The survey should focus its attention on those data most needed for the DoD M&S activities as described in Burgeson et al. (1996).

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APPENDIX A

CAPABILITIES QUESTIONNAIRE

E²DIS Project
Environmental Model and Database
Capabilities
Questionnaire

Administrative Information

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

A. Administrative Information

1. Title of Environmental Model or Database: _____

2. General Description of the Model or Database's Purpose:
(Alternatively, attach a 1- or 2-page existing description)

3. Technical Expert for the Above Model or Database

a. Rank/title, name, service: _____

b. Organization title and mailing address:

c. Phone numbers

(1) Office: DSN _____ - _____

Commercial () _____ - _____

(2) Fax: DSN _____ - _____

Commercial () _____ - _____

d. E-mail address: _____

4. Service/Organization Having Primary Responsibility for the Model or Database: (Circle one)

a. Army b. Navy c. Marine Corps d. Air Force e. Other (explain) _____

5. Organizational Location(s) of the Environmental Model or Database: _____

E²DIS Project
Environmental Model and Database
Capabilities
Questionnaire

Technical Information

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

B. Technical Information

1. Critical Environmental Factors

- a. What are the most critical factors, or issues, regarding the atmosphere and near space environment that have to be considered for your model or database?

- b. Where are these critical factors documented (e.g., identify applicable mission needs statement, statement of need, operational requirement document)

2. Status of the Model or Database (Circle one and fill in the appropriate blank(s))

- a. "Operational" today; frequency of use is: _____ times per day _____ times per week _____ per month
b. Not "operational" today, but will be "operational" by FY-97
c. None of the above (Explain: _____)

3. Application of the Model or Database

- a. Use in Distributed Interactive Simulation (DIS) (Circle one.)

- (1) Used in DIS today
(2) Not used in DIS today, but planned for DIS use before FY-97
(3) Not used in DIS today, and not planned for use in DIS before FY-97
(4) None of the above (Explain: _____)

- b. This model or database is used for the following types of simulations:

(Circle all that apply. Underline the predominant use.)

- (1) Constructive—Typically, classroom-setting simulations of large-scale (e.g., theater-wide) military activities.
(2) Virtual—Forces, platforms, weapon systems, and sensors modeled in simulators and fighting on synthetic battlefields depicted by these simulators.
(3) Live Play—Simulations using real-world forces and equipment in the field.

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

3. Application of the Model or Database [Continued]

c. Model or database's functional use

(Circle all that apply. Underline the one predominant category.)

- (1) Education and Training
- (2) Research and Development (includes Design and Engineering)
- (3) Test and Evaluation (includes both DT&E and OT&E)
- (4) Analysis
- (5) Production and Logistics
- (6) Military Operations (includes Mission Planning and Mission Rehearsal)

d. This model or database is primarily used for which simulation hierarchical category(ies)?

(Circle all that apply. Underline the one predominant category.)

- (1) Campaign level (Echelon above Corps)
- (2) Mission level (Corps/Division)
- (3) Many-on-many to few-on-few level (Combined Arms Task Force)
- (4) One-on-one level (Weapons System)
- (5) Engineering level (Weapon Subsystem Characteristics)
- (6) None of the above (Explain: _____)

e. Types of Applications Supported: (Circle as many as apply. Underline the predominant one.)

- (1) Sensor Acquisition of Targets
- (2) Mobility of Platforms/Forces
- (3) Decision Aids for Command and Control Authority
- (4) Other (Explain): _____

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

3. Application of the Model or Database [Continued]

- f. Identify missions, forces, platforms, weapon systems, communications systems, sensors, and targets being simulated or modeled: (Attach additional pages, if necessary.)

(1) Missions: _____

(2) Forces: _____

(3) Platforms: _____

(4) Weapons Systems: _____

(5) Communications Systems: _____

(6) Sensors:
 (a) Active: _____
 (b) Passive: _____

(7) Targets: _____

- g. Is there a user manual for the environmental model or database? (Circle one.)

- (1) Yes (If Yes, provide title: _____)
(2) No (If No, provide title of most authoritative reference: _____)

- h. Who is the primary customer for the environmental model or database?

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

4. Domain of the Environmental Model or Databases

a. **Horizontal Surface Domain** (Circle all that apply and underline the predominant one.)

- | | |
|--------------------|--|
| (1) Global | (All landmasses and all oceans/seas) |
| (2) Global land | (All landmasses, including adjacent waters) |
| (3) Global ocean | (All ocean areas, including adjacent coastlines) |
| (4) Regional land | (Specific land regions, including adjacent waters, e.g., western U.S. provide a list of the regions) |
| (5) Regional ocean | (Specific ocean regions, including adjacent coastlines. e.g., eastern North Pacific. Provide a list of the regions.) |
| (6) Littoral | (Typically, regional land areas within 650 nmi of coastline and regional ocean areas as far seaward as required. Provide a list.) |
| (7) Local land | (Very specific land areas, including adjacent waters. e.g., Fort Irwin, CA. Provide a list.) |
| (8) Local ocean | (Very specific ocean areas, including adjacent coastlines, e.g., southern California OPAREA. Provide a list.) |
| (9) Other | (Explain: _____) |

b. **Vertical Domain** (Circle all that apply and underline the predominant one; indicate the required,
specific ranges where requested.)

- | | |
|---|---|
| (1) Land surface | Required range: Depths of _____ km to _____ km |
| (2) Land subsurface | Required range: Depths of _____ km to _____ km |
| (3) Ocean surface | Required range: Depths of _____ km to _____ km |
| (4) Ocean subsurface | Required range: Depths of _____ km to _____ km |
| (5) Atmosphere | Required, specific altitude range is: km to _____ km |
| (a) Near-earth (Surface to 1-km altitude) | km to _____ km |
| (b) Atmosphere (1-km to 300-km altitude) | Required, specific altitude range is: km to _____ km |
| (6) Near space (300-km to 70,000-km altitude) | Required, specific altitude range is: km to _____ km |
| (7) Other | (Explain: _____) |

c. **Time Domain** (Fill in the blank and circle the appropriate units of measure.)

- (1) The time period typically being simulated is:
_____ minutes/hours/days/weeks/months
- (2) The maximum time period that can be simulated is:
_____ minutes/hours/days/weeks/months

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

5. Current Capabilities of Model or Database—Capabilities that are available Today

a. Grid

- (1) What type grid does the model or database typically use today? _____
- (2) What type map projection does the model or database typically use today? _____
- (3) What other grid(s) and projection(s) can the model or database use? _____

b. The following types of environmental data and effects are included in this model or database today?
(Circle all that apply, and complete the appropriate attachments.)

- (1) Atmospheric Data and Effects—Use Attachment 1
(Surface to 300-km altitude)
- (2) Near Space Data and Effects—Use Attachment 2
(300-km to 70,000-km altitude)
- (3) Other Data and Effects (Identify any other types of environmental data and environmental effects that are available for model/database runs, e.g., terrain or ocean parameters, features, processes and effects.)

c. Other Technical Capabilities. Please complete Attachment 3, which describes the following technical capabilities:

- (1) Scalability capabilities
- (2) Compatibility capabilities
- (3) Accessibility capabilities
- (4) VV & A capabilities
- (5) Currency capabilities

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

6. Future Capabilities of Environmental Model or Database—Capabilities that will be available when an upgrade to the model or database is implemented sometime in the **Future**

a. Will this model or database be upgraded by FY-97? (Circle one.)

- (1) Yes (If Yes, proceed to the next item, 6.b.)
(2) No (If No, proceed to item 6.c.)

b. Briefly, explain the reason(s) for this upgrade: _____

(1) **Changes resulting from the upgrade**

(a) List those "current capabilities" for environmental data and effects, identified in your responses to 5.a., 5.b., and 5.c. that will change as a result of the upgrade, and briefly describe how these capabilities will change quantitatively:

(b) Why are you changing your capabilities for environmental data and effects?

(2) **New capabilities**

(a) List any new environmental data and environmental effects that will be available as a result of the planned upgrade:

(b) Why are you implementing new environmental data and effects?

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

6. Future Capabilities of Environmental Model or Database [Continued]

c. Potential Value. If there are no plans for an upgrade, would an upgrade be considered if environmental data and resulting environmental effects would be required by a simulation user? (Circle one and fill in the blank.)

(a) Yes, for the following reason(s): _____

(b) No, for the following reason(s): _____

7. E²DIS Project Briefing. Would a briefing on the E²DIS Project be of interest to you for your simulation support efforts? (Circle one) Yes No

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

A. Environmental Model or Database Title: _____ (Fill in the blank.)

B. Vertical Domain: Atmosphere (including the near-earth atmosphere, i.e., surface to 300-km altitude)

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

| Atmospheric Data Type | Model or Database Currently Outputs This Data Type (Place an "X" where applicable) | Fidelity Capabilities of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | Model or Database Has the Potential to Output This Data Type (Place an "X" where applicable) |
|--|---|---|---|
| 1. Aerosols a. Cloud b. Haze c. Blowing Dust d. Volcanic Dust e. Smog | a. ____ b. ____ c. ____ d. ____ e. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ e. ____ |
| 2. Atmospheric Electricity a. Lightning b. Local Electric Field Potential | a. ____ b. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ |
| 3. Clouds a. % Sky Coverage b. Liquid Water c. Particle Size d. Bases/Tops e. Types (1) High (2) Medium (3) Low (4) Other (Specify) | a. ____ b. ____ c. ____ d. ____ e. ____ (1) ____ (2) ____ (3) ____ (4) ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ e. ____ (1) ____ (2) ____ (3) ____ (4) ____ |

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 4. Dew Point | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | — |
| 5. Fog | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | — |
| 6. Humidity a. Absolute b. Relative | a. _____ b. _____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. _____ b. _____ |
| 7. Mixing Ratio | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | — |

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities of the Model or Database</u> (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 8. Precipitation a. Rate b. Type (1) Rain (2) Freezing Rain (3) Graupel (4) Hail (5) Sleet (6) Snow | a. <input type="checkbox"/> b. <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/> (3) <input type="checkbox"/> (4) <input type="checkbox"/> (5) <input type="checkbox"/> (6) <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/> (3) <input type="checkbox"/> (4) <input type="checkbox"/> (5) <input type="checkbox"/> (6) <input type="checkbox"/> |
| 9. Refractivity | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |
| 10. Sea Level Pressure | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |
| 11. Static Stability | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 12. Temperature a. Atmosphere b. Surface-Land c. Surface-Ocean | a. ____ b. ____ c. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ |
| 13. Trace Gases | ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | ____ |
| 14. Transmissivity | ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | ____ |
| 15. Visibility a. Horizontal b. Slant Range | a. ____ b. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ |

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities of the Model or Database</u> (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|--|--|---|--|
| 16. Winds-General a. Horizontal b. Vertical | a. ____ b. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ |
| 17. Wind-Specific Features a. Fronts b. Gust Fronts c. Hurricanes/ Typhoons d. Thunderstorms e. Tornadoes/ Waterspouts f. Turbulence g. Wind Shear | a. ____ b. ____ c. ____ d. ____ e. ____ f. ____ g. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ e. ____ f. ____ g. ____ |
| 18. Radiative Features a. Sky Brightness b. Predetermined Natural Illumination Sources (e.g., particle emissitivity) c. Local Albedo (e.g., from soil, snow cover) d. Cloud Radiance | a. ____ b. ____ c. ____ d. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ |

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities of the Model or Database</u> (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|--|--|---|--|
| 19. Smoke a. Naturally Caused b. Human Generated | a. <input type="checkbox"/> b. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> |
| 20. Chaff Dispersion | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |
| 21. Combat-generated Dust—Development and Dispersion | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |
| 22. Contrail Formation and Dispersion | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|--|--|---|--|
| 23. Dispersal of a. Biological Agents b. Chemical Agents c. Flares d. Exhaust Plumes from Terrain Vehicles e. Industrial Smoke Plumes | a. ____ b. ____ c. ____ d. ____ e. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ e. ____ |
| 24. Nonnuclear Munitions Effects a. Explosive Shock-Induced Water Droplet Clouds b. Fireball Temperature | a. ____ b. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ |
| 25. Nuclear Weapons Detonation Effects a. Enhanced Radiance b. Dispersal of X-rays and Nuclear Particles c. Movement of Shock Waves d. Winds e. Elevated Temperatures | a. ____ b. ____ c. ____ d. ____ e. ____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ e. ____ |

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[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Atmospheric Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Atmospheric Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 26. Ship Exhaust Tracks (i.e., Dispersal of stack exhaust; ship wakes are not included here, since they are an ocean-embedded process) | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | — |

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Atmospheric Effects: (Circle all that apply and fill in the appropriate blanks.)

1. Sensor Systems

| | | | | |
|---|--|--|--|--|
| a. Name of Sensor System: | | | | |
| b. Energy Type (Specify frequency, wavelength bands or other standard units of measure) | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Particle Radiation _____ (4) Other: (Specify type and frequency band) _____ | | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Particle Radiation _____ (4) Other: (Specify type and frequency band) _____ | |
| c. Type of Sensor | (1) Active | (2) Passive | (1) Active | (2) Passive |
| d. Environmental Effects Capability | (1) Absorption (2) Ducting (3) Emission (4) Reflection | (5) Refraction (6) Scattering (7) Transmission (8) Other: (Specify) _____ | (1) Absorption (2) Ducting (3) Emission (4) Reflection | (5) Refraction (6) Scattering (7) Transmission (8) Other: (Specify) _____ |
| e. What line-of-sight sensor-target geometries are possible? | (1) Nadir / Near-nadir (2) Limb / Near-limb (3) Zenith / Near-zenith (4) Other: (Provide azimuth and bearings from sensor) _____ | | (1) Nadir / Near-nadir (2) Limb / Near-limb (3) Zenith / Near-zenith (4) Other: (Provide azimuth and bearings from sensor) _____ | |
| f. Altitude capabilities for sensor and target: | (1) Sensor altitude range is: _____ km to _____ km. (2) Target altitude range is: _____ km to _____ km. | | (1) Sensor altitude range is: _____ km to _____ km. (2) Target altitude range is: _____ km to _____ km. | |
| g. General state of the environment possible: | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | |

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Atmospheric Effects: (Circle all that apply and fill in the appropriate blanks.)

[Continued]

2. Communications Systems

| | | | | | | | | |
|---|---|--|--|--|---|--|--|--|
| a. Name of Communications System: | | | | | | | | |
| b. Energy Type (Specify frequency, wavelength bands or other standard units of measure) | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Other: (Specify type and frequency band) _____ | | | | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Other: (Specify type and frequency band) _____ | | | |
| c. Environmental Effects Capabilities | (1) Absorption (2) Ducting (3) Emission (4) Reflection | | (5) Refraction (6) Scattering (7) Transmission (8) Other: (Specify) | | (1) Absorption (2) Ducting (3) Emission (4) Reflection | | (5) Refraction (6) Scattering (7) Transmission (8) Other: (Specify) | |
| d. What type of transmitter-receiver geometries are possible? | (1) Line-of-Sight (2) Over-the-Horizon (a) Upper limit of altitude for energy path is: _____ km. (b) Horizontal limit for energy path is: _____ km. (3) Other: (Describe) _____ | | | | (1) Line-of-Sight (2) Over-the-Horizon (a) Upper limit of altitude for energy path is: _____ km. (b) Horizontal limit for energy path is: _____ km. (3) Other: (Describe) _____ | | | |
| e. Altitude capabilities for transmitter and receiver: | (1) Transmitter altitude range is: _____ km to _____ km. (2) Receiver altitude range is: _____ km to _____ km. | | | | (1) Transmitter altitude range is: _____ km to _____ km. (2) Receiver altitude range is: _____ km to _____ km. | | | |
| f. General state of the environment possible: | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | | | | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | | | |

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Attachment 1: Atmospheric Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Atmospheric Effects: (Circle all that apply and fill in the appropriate blanks.)

[Continued from]

3. Weapon Systems

| | | |
|--|---------------|---------------|
| a. Name of Weapon System: | | |
| b. Possible atmospheric effect(s) on the performance of the weapon system (e.g., deflection of projectiles/ordnance ballistic trajectories due to wind): | Provide list: | Provide list: |

4. Platforms

| | | |
|--|---------------|---------------|
| a. Name of Platform: | | |
| b. Possible atmospheric effect(s) on the performance of the platform (e.g., ice accretion on aircraft, ships, terrain vehicles): | Provide list: | Provide list: |

5. Forces

| | | |
|--|---------------|---------------|
| a. Type/Name of Force: | | |
| b. Possible atmospheric effect(s) on the performance of the force (e.g., temperature effects on workload performance/combat efficiency): | Provide list: | Provide list: |

6. Other

| | | |
|---|---------------|---------------|
| a. Type/Name of Object: | | |
| b. Possible atmospheric effect(s) on the performance of the object: | Provide list: | Provide list: |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

A. Model or Database Title: _____ (Fill in the blank.)

B. Vertical Domain: Near Space (300-km to 70,000-km altitude)

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs</u> This Data Type (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | Model or Database Has the <u>Potential to</u> <u>Output</u> This Data Type (Place an "X" where applicable) |
|---|---|---|--|
| 1. Auroral Particle Precipitation (i.e., Energy Flux) | — | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | — |
| 2. Cosmic Rays | — | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | — |
| 3. Diffuse Zodiacal Emission a. Infrared b. Visible | a. _____ b. _____ | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | a. _____ b. _____ |
| 4. Geomagnetic Field a. Strength b. Indices | a. _____ b. _____ | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | a. _____ b. _____ |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 5. Interplanetary Medium a. Interplanetary Magnetic Field (1) Strength (2) Orientation b. Solar Wind (1) Velocity (2) Density (3) Temperature c. Magnetopause Standoff Distance | a. _____ (1) _____ (2) _____ b. _____ (1) _____ (2) _____ (3) _____ c. _____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ • Required Range: Min. = _____ Max. = _____ • Required Accuracy: _____ | a. _____ (1) _____ (2) _____ b. _____ (1) _____ (2) _____ (3) _____ c. _____ |
| 6. Low Energy Plasma Environment a. Ions (1) Composition (2) Number Density (3) Avg. Velocity (4) Temperature (5) Flux b. Electrons (1) Number Density (2) Vertical Profiles (3) Total Electron Content (4) Avg. Velocity (5) Temperature (6) Flux | a. _____ (1) _____ (2) _____ b. _____ (1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ • Required Range: Min. = _____ Max. = _____ • Required Accuracy: _____ | a. _____ (1) _____ (2) _____ b. _____ (1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|---|---|---|
| 7. Lunar Parameters a. Lunar Brightness b. Lunar Position | a. <input type="checkbox"/> b. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> |
| 8. Meteoroids and Debris a. Mass b. Diameter c. Density d. Flux e. Impact Flux Size Distribution | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> e. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> e. <input type="checkbox"/> |
| 9. Neutral Environment a. Composition b. Density c. Temperature d. Winds | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> |
| 10. Radio Background Noise | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 11. Solar Parameters a. Solar Position b. Solar Radiative Flux c. Sunspot Activity d. Solar Index | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> |
| 12. Star and Planetary Positions | <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | <input type="checkbox"/> |
| 13. Energetic Particles a. Particle Type b. Energy c. Flux d. Spatial and Temporal Distribution | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> |
| 14. Geomagnetic Storms a. Magnetosphere b. Aurora c. Radiation Belts d. Spatial and Temporal Distribution | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ •• Required Range: Min. = _____ Max. = _____ •• Required Accuracy: _____ | a. <input type="checkbox"/> b. <input type="checkbox"/> c. <input type="checkbox"/> d. <input type="checkbox"/> |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|-----------------------------|--|---|--|
| 15. Gravity Waves | — | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | — |
| 16. Noctilucent Clouds | — | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | — |
| 17. Polar Cap Absorption | — | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | — |
| 18. Sporadic E | — | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | — |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 19. Sudden Ionospheric Storms | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ • Required Range: Min. = _____ Max. = _____ • Required Accuracy: _____ | — |
| 20. Dispersal of Flares | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ • Required Range: Min. = _____ Max. = _____ • Required Accuracy: _____ | — |
| 21. Formation and Dispersal of Rocket Exhaust | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ • Required Range: Min. = _____ Max. = _____ • Required Accuracy: _____ | — |
| 22. Munitions Effects (Nonnuclear) | — | <ul style="list-style-type: none"> • Horizontal Grid Spacing: _____ m. • Vertical Grid Spacing: _____ m. • Time Resolution: _____ sec. • Units of Measure for Data Type: _____ • Required Range: Min. = _____ Max. = _____ • Required Accuracy: _____ | — |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

C. Capabilities for Near Space Data: (Check all that apply in the appropriate column.)

[Continued]

| <u>Near Space Data Type</u> | <u>Model or Database Currently Outputs This Data Type</u> (Place an "X" where applicable) | <u>Fidelity Capabilities</u> of the Model or Database (Fill in the blanks only if Column 2 is "X'd") | <u>Model or Database Has the Potential to Output This Data Type</u> (Place an "X" where applicable) |
|---|--|---|--|
| 23. Nuclear Weapons Detonation Effects a. Elevated Temperatures b. Enhanced Radiance c. Dispersal of X-rays and Nuclear Particles d. Movement of Shock Wave e. Nuclear Heave f. Winds | a. ____ b. ____ c. ____ d. ____ e. ____ f. ____ | <ul style="list-style-type: none"> ● Horizontal Grid Spacing: _____ m. ● Vertical Grid Spacing: _____ m. ● Time Resolution: _____ sec. ● Units of Measure for Data Type: _____ ●● Required Range: Min. = _____ Max. = _____ ●● Required Accuracy: _____ | a. ____ b. ____ c. ____ d. ____ e. ____ f. ____ |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Near Space Effects: (Circle all that apply and fill in the appropriate blanks.)

1. Sensor Systems

| | | | | |
|---|--|--|--|--|
| a. Name of Sensor System: | | | | |
| b. Energy Type (Specify frequency, wavelength bands or other standard units of measure) | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Particle Radiation _____ (4) Other: (Specify type and frequency band) _____ | | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Particle Radiation _____ (4) Other: (Specify type and frequency band) _____ | |
| c. Type of Sensor | (1) Active | (2) Passive | (1) Active | (2) Passive |
| d. Environmental Effects Capability | (1) Absorption (2) Ducting (3) Emission (4) Reflection | (5) Refraction (6) Scattering (7) Transmission (8) Other: (Specify) _____ | (1) Absorption (2) Ducting (3) Emission (4) Reflection | (5) Refraction (6) Scattering (7) Transmission (8) Other: (Specify) _____ |
| e. What line-of-sight sensor-target geometries are possible? | (1) Nadir/Near-nadir (2) Limb/Near-limb (3) Zenith/Near-zenith (4) Other: (Provide azimuth and bearings from sensor) _____ | | (1) Nadir/Near-nadir (2) Limb/Near-limb (3) Zenith/Near-zenith (4) Other: (Provide azimuth and bearings from sensor) _____ | |
| f. Altitude capabilities for sensor and target: | (1) Sensor altitude range is: _____ km to _____ km. (2) Target altitude range is: _____ km to _____ km. | | (1) Sensor altitude range is: _____ km to _____ km. (2) Target altitude range is: _____ km to _____ km. | |
| g. General state of the environment possible: | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Near Space Effects: (Circle all that apply and fill in the appropriate blanks.)

[Continued]

2. Communications Systems

| | | | | |
|---|---|---|---|--|
| a. Name of Communications System: | | | | |
| b. Energy Type (Specify frequency, wavelength bands or other standard units of measure) | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Other: (Specify type and frequency band) _____ | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Other: (Specify type and frequency band) _____ | (1) Acoustic _____ (2) Electromagnetic Radiation _____ (3) Other: (Specify type and frequency band) _____ | |
| c. Environmental Effects Capabilities | (1) Absorption (5) Refraction (2) Ducting (6) Scattering (3) Emission (7) Transmission (4) Reflection (8) Other: (Specify) _____ | (1) Absorption (5) Refraction (2) Ducting (6) Scattering (3) Emission (7) Transmission (4) Reflection (8) Other: (Specify) _____ | (1) Absorption (5) Refraction (2) Ducting (6) Scattering (3) Emission (7) Transmission (4) Reflection (8) Other: (Specify) _____ | |
| d. What type of transmitter-receiver geometries are possible? | (1) Line-of-Sight (2) Over-the-Horizon (a) Upper limit of altitude for energy path is: _____ km. (b) Horizontal limit for energy path is: _____ km. (3) Other: (Describe) _____ | (1) Line-of-Sight (2) Over-the-Horizon (a) Upper limit of altitude for energy path is: _____ km. (b) Horizontal limit for energy path is: _____ km. (3) Other: (Describe) _____ | (1) Line-of-Sight (2) Over-the-Horizon (a) Upper limit of altitude for energy path is: _____ km. (b) Horizontal limit for energy path is: _____ km. (3) Other: (Describe) _____ | |
| e. Altitude capabilities for transmitter and receiver: | (1) Transmitter altitude range is: _____ km to _____ km. (2) Receiver altitude range is: _____ km to _____ km. | (1) Transmitter altitude range is: _____ km to _____ km. (2) Receiver altitude range is: _____ km to _____ km. | (1) Transmitter altitude range is: _____ km to _____ km. (2) Receiver altitude range is: _____ km to _____ km. | |
| f. General state of the environment possible: | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | (1) Quiescent conditions (a) Day (b) Night (c) Terminator (2) Disturbed conditions (a) Aurorally-disturbed (b) Nuclear-disturbed (c) Other (Specify): _____ | | |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Near Space Effects: (Circle all that apply and fill in the appropriate blanks.)

[Continued]

3. Weapon Systems

| | | |
|---|---------------|---------------|
| a. Name of Weapon System: | | |
| b. Possible near space effect(s) on the performance of the weapon system: | Provide list: | Provide list: |

4. Platforms

| | | |
|---|---------------|---------------|
| a. Name of Platform: | | |
| b. Possible near space effect(s) on the performance of the platform (e.g., drag effects on satellites): | Provide list: | Provide list: |

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Attachment 2: Near Space Data and Effects

[Complete all items. Use "N/A" if not applicable, or a "?" if unknown.]

D. Capabilities for Near Space Effects: (Circle all that apply and fill in the appropriate blanks.)

[Continued]

5. Forces

| | | |
|--|---------------|---------------|
| a. Type/Name of Force: | | |
| b. Possible near space effect(s) on the performance of the force (e.g., zero gravity effects on workload performance/combat efficiency): | Provide list: | Provide list: |

6. Other

| | | |
|--|---------------|---------------|
| a. Type/Name of Object: | | |
| b. Possible near space effect(s) on the performance of the object: | Provide list: | Provide list: |

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Attachment 3: Other Capabilities

[Complete all items. Use "N/A" if not applicable, or a "?" unknown.]

A. Environmental Model or Database Title: _____ (Fill in the blank.)

B. Type(s) of Environmental Data / Effects:

(Circle below all the environmental data types, identified in the responses to Attachments 1 and 2, that have the same fidelity capabilities. Grouping is encouraged to minimize the number of Attachment 3 forms to be completed. Duplicate this attachment as necessary to characterize all grouped data types/effects.)

- | | |
|---|--|
| 1. Atmospheric Data/Effects—Attachment 1: | C. 1., 2., 3., 4., 5., 6., 7., 8., 9., 10., 11., 12., 13., 14., 15., 16., 17., 18., 19., 20., 21., 22., 23., 24., 25., 26. |
| | D. 1., 2., 3., 4., 5., 6. |
| 2. Near Space Data/Effects—Attachment 2: | C. 1., 2., 3., 4., 5., 6., 7., 8., 9., 10., 11., 12., 13., 14., 15., 16., 17., 18., 19., 20., 21., 22., 23. |
| | D. 1., 2., 3., 4., 5., 6. |

C. Other Capabilities:

1. Scalability Capabilities

- a. Do the Model or Database's spatial grid and time interval have scaling capabilities from the baseline fidelity capabilities identified in Attachments 1 and 2?

(Circle the appropriate answer.)

Yes

No

- b. If No, proceed to the next item.

If Yes,

(1) Briefly explain what grid and time interval scaling is possible: _____

(2) Identify any scaling capabilities for each environmental data type: _____

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Attachment 3: Other Capabilities

[Complete all items. Use "N/A" if not applicable, or a "?" unknown.]

C. Other Capabilities:

[Continued]

2. Compatibility Capabilities

a. Software

(1) Operating System. What operating system software is used to run this model or database?

(2) Programming Languages. What programming languages are used ?

(3) Database Management System. What database management system is used ?

(4) Near-term Changes. Will any of these three types of software capabilities change by FY-97?
(Circle the appropriate answer.) Yes No

(a) If Yes, please identify the specific changes: _____

(b) If No, proceed to the next item.

b. Hardware

(1) What host hardware system is currently used to run the model or database? _____

(2) Is the host hardware system transportable?

(Circle the appropriate answer.) Yes No

(3) What type(s) of data media can the system accept?

(Circle all that apply.)

(a) Nine-track Tape (f) WORM (Specify size)

(b) Floppy Disk (g) Floptical Disk

(c) CD-ROM (h) Optical Tape

(d) VLDS (i) Video Disk

(e) 8-mm Cartridge (j) Other: (Specify) _____

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Attachment 3: Other Capabilities

[Complete all items. Use "N/A" if not applicable, or a "?" unknown.]

C. Other Capabilities:

[Continued]

3. Accessibility Capabilities

a. Security. What is the maximum information security level of the environmental data authorized for use by the Environmental Model or Database? (Circle the appropriate answer.)

- (1) Unclassified
- (2) Confidential
- (3) Secret
- (4) Top Secret
- (5) Other—Explain in unclassified terms: _____

b. Connectivity. What methods of external communications are authorized to output data? (Circle all that apply.)

- (1) None
- (2) Unclassified telephone (with modem) dial-up line.
- (3) Encrypted telephone (with modem) dial-up line.
- (4) Other—Explain briefly: _____

4. VV&A Capabilities

a. Verification. Has the environmental model or database been "verified" ? (Circle one.) Yes No

- (1) If Yes,
 - (a) Who performed the verification? _____
 - (b) To what level of detail was the verification conducted? _____
- (2) If No, proceed to the next item.

b. Validation. Has the environmental model or database been "validated" ? (Circle one.) Yes No

- (1) If Yes,
 - (a) Who performed the validation? _____
 - (b) How was the validation conducted? _____
- (2) If No, proceed to the next item.

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Attachment 3: Other Capabilities

[Complete all items. Use "N/A" if not applicable, or a "?" unknown.]

C. Other Capabilities:

4. VV&A Capabilities

[Continued]

c. Accreditation. Has the environmental model or database been "accredited"?

(Circle one.) Yes No

(1) If Yes,

- (a) Who performed the accreditation? _____
(b) For what purposes was the model or database accredited? _____

(2) If No, proceed to the next item.

5. Currency of Data Capabilities

a. Does the environmental model or database use reasonably current real-world data?

(Circle one.)

(1) Yes. Briefly explain how current the data is: _____

(2) No. Briefly explain why current real-world data is not used: _____

APPENDIX B

SERVICE LETTERS



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE



22 DEC 1994

MEMORANDUM FOR SEE DISTRIBUTION

FROM: HQ USAF/XOW
1490 Air Force Pentagon
Washington DC 20330-1490

SUBJECT: Environmental Effects for Distributed Interactive Simulation (E²DIS) Project
Modeling & Simulation Capabilities Survey

The Defense Modeling & Simulation Office (DMSO) is sponsoring the multi-Service E²DIS Project. One of the project's primary goals is to determine the Services' current capabilities regarding atmospheric and near-space models and databases, including environmental effects models and databases. This assessment will provide DMSO and the Services with a basis for incorporating appropriate fidelity, physics-based representations of the natural, physical environment and environmental effects into distributed interactive simulations. To help meet this goal, the E²DIS Project Team has selected Science and Technology Corporation (STC) to survey the Services and other Government agencies.

Additional E²DIS Project background information and a summary of the survey task is provided at attachment 2. Distribution of the results of this survey task, in the form of the products listed in attachment 2, will be made to all survey respondents once the survey data are compiled and analyzed.

Request you complete as many of the questionnaires at attachment 3 as is appropriate for the models and databases under your organization's purview. Please provide completed questionnaires by **31 January 1995** to:

Science and Technology Corporation
Attn: Tom Piwowar
409 Third Street, S.W.
Suite 203
Washington DC 20024

Facsimile: (202) 488-5364
Phone: (202) 863-0012

USAFETAC and AFGWC should send responses through HQ AWS/XOX. The 50 WS should send a courtesy copy of responses to their parent organization. Direct distribution to these three units has been coordinated with HQ AWS/XOX and HQ AFSPC/DOOW.

Direct any comments or questions to the Air Force point of contact, Mr. Donald Grantham, Phillips Laboratory (Hanscom AFB, MA), DSN 478-2982 or Commercial (617) 377-2982.



THOMAS F. TASCIONE, Colonel, USAF
Deputy Director of Weather
DCS, Plans and Operations

Attachments:

1. Distribution List
2. E²DIS Project and Survey Task Summary
3. Capabilities Survey Guidelines and Questionnaire

cc:

HQ USAF/XOMT

DISTRIBUTION LIST

AWS/XO

USAFETAC/DO

AFGWC/DO

HQ AFSPC/DOOW

50 WS/CC

Phillips Laboratory/GP

SAF/SS (Attn: Maj Steve Musto)

Attachment 1

Environmental Effects for Distributed Interactive Simulation (E²DIS) Project and Survey Task Summary

The Defense Modeling and Simulation Initiative of 1 May 1992 identified the creation of synthetic environments as a major goal. Generally, synthetic environments should be capable of providing realistic information about the earth's natural, physical environment. For a synthetic environment to be "realistic," it has to simulate the actual, natural, physical environment (i.e., land, oceans, atmosphere, and near-space) properly in the time and space dimensions.

To meet this goal, the Defense Modeling and Simulation Office (DMSO) is sponsoring the joint-service E²DIS project. The project seeks to:

- a. Develop functional design requirements of an architecture that accounts for appropriate physics-based environmental effects in distributed modeling and simulation systems.
- b. Develop joint-service standards for environmental data communication protocols.
- c. Demonstrate "use cases" for the architecture concept and communication protocols.
- d. Survey the Services to determine modeling and simulation requirements for environmental effects.
- e. Survey the Services to determine environmental data base capabilities which support, or could support, the users' requirements for environmental effects.

For the E²DIS Project, "environmental effects" is defined as the impacts, either positive or negative, that the natural, physical environment has on natural and man-made objects in the battlespace of the simulation exercise, such as a change in characteristics of the land surface, or changes in the performance of a military force/unit, platform, weapon system, or sensor. Examples are wetting of the land surface by a rain event, hindrance of troop movements due to wet soil, increased ground speed of an aircraft with a tailwind, and ducting of transmitted and returned radar energy by atmospheric trapping layers.

One of the E²DIS project tasks calls for a survey of requirements and capabilities, and is divided into three sub-tasks:

- Sub-task 1: Determine the major modeling and simulation requirements (current and anticipated) for Army, Navy, Air Force, and Marine Corps activities involving weapon systems operating in the atmosphere and near-space for environmentally realistic simulation.

Attachment 2

Sub-task 2: Identify existing environmental models and databases available to support simulation activities.

Sub-task 3: Assess the applicability of the environmental models and databases to support major modeling and simulation requirements.

The results of these sub-tasks will be published in three documents:

- The *Environment Simulation Requirements Document*
- The *Environment Model and Database Catalog*
- The *Analysis and Required New Capabilities Document*

Phillips Laboratory (Hanscom AFB MA) is managing the execution of this overall task. Representatives from Phillips Laboratory, the Army Research Laboratory (White Sands Missile Range NM) and the Naval Research Laboratory (Monterey CA) are on the Government's task team. To assist in performing the survey task, Phillips Laboratory has selected Science and Technology Corporation (STC) to develop and conduct a formal, comprehensive survey of specific Service organizations and offices.

The E²DIS Project team manager is Dr. Harry Heckathorn, Naval Research Laboratory, Washington DC, (202) 767-4198.

Attachment 2

Environmental Effects for Distributed Interactive Simulation (E²DIS) Project Capabilities Survey Guidelines

Survey Team. To accomplish the work associated with the survey task, the E²DIS Project has selected Science and Technology Corporation (STC) to interface with the Services and other Government agencies. STC Survey Team members include: Dr. Paul Try, Mr. John Burgeson, Mr. Ken Eis, Mr. Carl Chesley, Mr. Jerry Johnson, Mr. Paul Cooper, and Mr. Tom Piwowar.

Survey Procedure.

- a. Make copies of the questionnaire available to your organizations' technical points of contact.
- b. Complete and forward questionnaires to arrive by the suspense date.
- c. Forward completed questionnaires to:

Science and Technology Corporation
Attn: Tom Piwowar
409 Third Street, S.W.
Suite 203
Washington DC 20024

Facsimile: (202) 488-5364
Phone: (202) 863-0012

- d. The Survey Team will review the returned questionnaires and enter the data in the Project database.

- e. On a case-by-case basis, Survey Team members will conduct follow-up telephonic and in-person interviews with technical points-of-contact to clarify questionnaire responses.

Government Point-of-Contact. The Air Force representative and leader for the E²DIS Project survey task is:

Mr. Donald Grantham
Phillips Laboratory (Hanscom AFB MA)
Phone: (617) 377-2982 or DSN 478-2982
Facsimile: (617) 377-2984

Notify Mr. Grantham of any issues that arise during the execution of this survey effort.

Attachment 3



DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR INTELLIGENCE
WASHINGTON, DC 20310-1001

REPLY TO
ATTENTION OF

DAMI-POB (70-1p)



3 January 1995

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Survey to Identify Existing Environmental Models and Data Bases used to Support Simulation Activities

1. Request you complete Enclosure 3 survey for each environmental model or data base you use to support simulations activities. Submit completed surveys by 30 January 1995 directly to the supporting contractor: Science and Technology Corporation, ATTN: Tom Piowar, 409 Third Street, SW, Suite 203, Washington, DC 20024, PH: (202) 863-0012, FAX: (202) 488-5364.
2. HQDA, DAMI-POB serves on the Executive Advisory Committee for the Defense Modeling and Simulations Office (DMSO) sponsored multi-Service Environmental Effects Distributed Interactive Simulations (E²DIS) project, which is linking together several Services research efforts into a single interactive simulation. One of the tasks listed in the Project Development Plan is to conduct a survey to establish a baseline of information about how environmental effects are currently being used in simulations. Your accurate description in the Enclosure 3 survey will be of great assistance to them, and we ask you full cooperation. Additional information about the E²DIS project is at Enclosures 1 and 2.
3. If you have questions contact the technical advisor, Dr. Richard Shirkey, Army Research Laboratory, Battlefield Environment Directorate (ARL/BED), ATTN: AMSRL-BE-S, White Sands Missile Range, NM 88002-5501, DSN 258-5470, or COM (505) 678-5470.
4. Please fill out a separate questionnaire for each data base or model your organization uses to support an Army simulation activity in order to determine current capabilities regarding support for simulations, including atmosphere and near-space models. DMSO will use your answers to develop the right fidelity and physics in the E²DIS project.
5. HQDA, DAMI-POB point of contact is Mr. Lee Page, DSN 225-5509.

FOR THE DIRECTOR OF INTELLIGENCE POLICY AND OPERATIONS:

JOHN E. GENTRY
Colonel, GS
Chief, DAMI-POB

DAMI-POB (70-1p)

SUBJECT: Survey to Identify Existing Environmental Models and Data Bases used to Support Simulation Activities

DISTRIBUTION:

DIRECTOR

U.S. ARMY RESEARCH LABORATORY, BATTLEFIELD ENVIRONMENT
DIRECTORATE, ATTN: AMSRL-BE, WHITE SANDS MISSILE RANGE, NM
88002-5501

U.S. ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY,
ATTN: CECRL-TD, 72 LYME ROAD, HANOVER, NH 03755-1290

U.S. ARMY TOPOGRAPHIC CENTER, ATTN: CETEC-GL, FORT BELVOIR, VA
22060-5546

U.S. ARMY WATERWAYS EXPERIMENT STATION, ATTN: CEWES-CD, 3909
HALLS FERRY ROAD, VICKSBURG, MS 19180-6199

COMMANDER

U.S. ARMY COMBINED ARMS CENTER, ATTN: ATZL-CAW, FORT
LEAVENWORTH, KS 66027-5300

USAFETAC/CC, 859 BUCHANAN ROAD, SCOTT AFB, IL 62225-5116

CF:

DIRECTOR, U.S. ARMY MODEL AND SIMULATION OFFICE, 1725 JEFFERSON
DAVIS HIGHWAY, CRYSTAL SQ II, SUITE 808, ARLINGTON, VA 22202-5000
SCIENCE AND TECHNOLOGY CORPORATION, ATTN: MR. TOM PIOWAR, 409
THIRD ST, SW, SUITE 203, WASHINGTON DC, 20024

Environmental Effects for Distributed Interactive Simulation

(E²DIS)

Project and Survey Task Summary

E²DIS. The Defense Modeling and Simulation Initiative of 1 May 1992 identified the creation of synthetic environments as a major goal. Generally, synthetic environments should be capable of providing realistic information about the earth's natural, physical environment. For a synthetic environment to be "realistic," it has to simulate the actual, natural, physical environment (i.e., land, oceans, atmosphere, and near-space) properly in the time and space dimensions (i.e., in the horizontal and vertical).

In recognition of this major goal, as well as the magnitude and complexity of the work needed to achieve the goal, the Defense Modeling and Simulation Office (DMSO) is supporting a joint-service project entitled "Environmental Effects for Distributed Interactive Simulation (E²DIS)." The E²DIS project seeks to:

1. Develop functional design requirements of an architecture that accounts for appropriate physics-based environmental effects in distributed modeling and simulation systems.
2. Develop joint-service standards for environmental data communication protocols.
3. Demonstrate "use cases" for the architecture concept and communication protocols.
4. Survey the Services to determine modeling and simulation requirements for environmental effects.
5. Survey the Services to determine environmental data base capabilities which support, or could support, the users' requirements for environmental effects.

For the E²DIS Project, "environmental effects" is defined as the impacts, either positive or negative, that the natural, physical environment has on natural and man-made objects in the battlespace of the simulation exercise, such as a change in characteristics of the land surface, and changes in the performance of a military force/unit, platform, weapon system, or sensor. Examples are wetting of the land surface by a rain event; hindrance of troop movements due to wet soil; increased ground speed of an aircraft with a tailwind; and ducting of transmitted and returned radar energy by atmospheric trapping layers.

A Memorandum of Agreement establishes the working relationship between DMSO and the E²DIS project team. A Program Development Plan (PDP) describes how the E²DIS goals will be achieved. Eight task areas are defined and detailed descriptions are provided to show how each of these tasks will be executed.

Project team manager for the E²DIS Project is Dr. Harry Heckathorn, Naval Research Laboratory, Washington, D.C., (202) 767-4198.

Enclosure 1

E²DIS Project

Task 5. Task 5 of the E²DIS project is the Survey of Requirements and Capabilities task, which is divided into three sub-tasks:

- Sub-task 1: Determines the major modeling and simulation requirements (current and anticipated) for Army, Navy, Air Force and Marine Corps activities involving weapon systems operating in the atmosphere and near-space for environmentally realistic simulation.
- Sub-task 2: Identifies existing environmental models and databases available to support simulation activities.
- Sub-task 3: Assesses the applicability of the environmental models and databases to support major modeling and simulation requirements.

The results of these sub-tasks will be published in three documents:

- The *Environment Simulation Requirements Document*
- The *Environment Model and Database Catalog*
- The *Analysis and Required New Capabilities Document*

Management-wise, the Air Force's Phillips Laboratory (Hanscom Air Force Base, Massachusetts) is the lead activity for executing this task. Representatives from Phillips Laboratory, the Army Research Laboratory (White Sands Missile Range, New Mexico) and the Naval Research Laboratory (Monterey, California) comprise the Government's Task 5 Team. To assist in performing the survey task, Phillips Laboratory has selected Science and Technology Corporation (STC) to develop and conduct a formal, comprehensive survey of specific Service organizations and offices.

Enclosure 1

Environmental Effects for Distributed Interactive Simulation

(E²DIS) Project

Capabilities Survey Guidelines

Survey Team. To accomplish the work associated with the Survey Task, the E²DIS Project has selected Science and Technology Corporation (STC) to interface with the Services and other Government agencies. STC Survey Team members include: Dr. Paul Try, John Burgeson, Ken Eis, Carl Chesley, Jerry Johnson, Paul Cooper, and Tom Piwowar.

Survey Procedure.

1. Your organization receives a tasking letter or memorandum originated within your Service (A copy of the Capabilities Questionnaire is attached). Copies of the questionnaire are made available to your organizations' technical points-of-contact.
2. Questionnaires are completed by the suspense date.
3. Completed questionnaires are forwarded to:

Science and Technology Corporation
Attn: Tom Piwowar
409 Third Street, S.W.
Suite 203
Washington, D.C. 20024

Facsimile: (202) 488-5364
Phone: (202) 863-0012

4. Survey Team reviews the returned questionnaires and enters the data in the Project's database.

5. On a case-by-case basis, Survey Team members conduct follow-up telephonic and in-person interviews with technical points-of-contact to clarify questionnaire responses.

Government Point-of-Contact. The Army representative for the E²DIS Project's Survey Task is:

Dr. Richard Shirkey
Army Research Laboratory
White Sands Missile Range, New Mexico

Phone: (505) 678-5470 or DSN 258-5470
Facsimile: (505) 678-8366

Dr. Shirkey should be notified of any issues that might arise during the execution of this survey.

Enclosure 2



DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

3140
961/ 5U573020
17 Jan 95

From: Chief of Naval Operations (N096)

Subj: ENVIRONMENTAL EFFECTS FOR DISTRIBUTED INTERACTIVE
SIMULATION (E²DIS) PROJECT MODELING & SIMULATION
CAPABILITIES SURVEY

Encl: (1) E²DIS Project and Survey Task Summary
(2) Capabilities Survey Guidelines and Questionnaire

1. The Defense Modeling & Simulation Office (DMSO) is sponsoring the multi-service E²DIS Project. One of the project's key goals is to determine the Services' current capabilities regarding atmospheric and near-space models and databases, including environmental effects models and databases. This assessment will provide DMSO and the services with a basis for incorporating appropriate fidelity, physics-based representations of the natural, physical environment and environmental effects into distributed interactive simulations. To assist in achieving this goal, the E²DIS Project Team has selected Science and Technology Corporation (STC) to survey the services and other government agencies. Enclosure (1) provides additional E²DIS Project background information and a summary of the survey task.

2. Enclosure (2) contains information on how the survey will be conducted and the capabilities questionnaire. Request you support STC with this survey of your organization by completing as many questionnaires as are appropriate for the models and databases under your organization's cognizance. Please provide completed questionnaires by 17 February 1995 to the following:

Science and Technology Corporation
Attn: Tom Piwowar
409 Third Street, S.W.
Suite 203
Washington, D.C. 20024

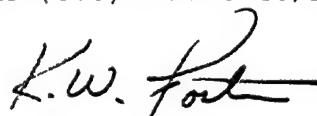
Facsimile: (202) 488-5364
Phone: (202) 863-0012

3. Your response and accurate completion of these capabilities questionnaires are imperative, for they will establish the data base for modeling and simulation requirements, including the atmosphere and near-space environments and environmental effects. The results

Subj: ENVIRONMENTAL EFFECTS FOR DISTRIBUTED INTERACTIVE
SIMULATION (E²DIS) PROJECT MODELING & SIMULATION
CAPABILITIES SURVEY

of this survey effort, in the form of the products listed in enclosure (1), will be available to all survey respondents once the survey data is compiled and analyzed.

4. If you have any comments or questions, the N096 point-of-contact is CDR Terry Tielking, N961E, COMM (202) 653-1616/DSN 294-1616 and the Navy E²DIS point-of-contact is Mr. Sam Brand, Naval Research Laboratory, Monterey, CA, COMM (408) 656-4748/DSN 878-4748.



K. W. FOSTER
Oceanographer of the Navy
Acting

Distribution:

COMNAVMETOCCOM
COMNAVSPACECOM Dahlgren, VA
COMSPAWARSCOM Washington DC
COMNAVSEASYS COM Washington DC
MCCDC, MCMSMO
NRL Washington, DC
NRL Monterey, CA
NRL Stennis Space Center, MS
ONR Arlington, VA
JHU/APL
NAVPACMISTESTCEN Point Magu, CA
NAVAIRWARCENACDIV Orlando, FL
NAVAIRWARCENACDIV Patuxent River, MD
NAVAIRWARCENACDIV Trenton, NJ
NAVAIRWARCENACDIV China Lake, CA
NAVSURFWARCENDIV Dahlgren, VA
NAVSURFWARCENDIV Panama City, FL
NAVSURFWARCENDIV Port Hueneme, CA
NAVSURFWARCENDIV Indian Head, MD
NAVSURFWARCENDIV Carderock, MD
NAVUNSEAWARCENDET New London, CT
NAVUNSEAWARCENDIV Newport, RI
NAVUNSEAWARCENDIV Keyport, WA
NCCOSC San Diego, CA
COMINTICEPAT Groton, CT

Subj: ENVIRONMENTAL EFFECTS FOR DISTRIBUTED INTERACTIVE
SIMULATION (E²DIS) PROJECT MODELING & SIMULATION
CAPABILITIES SURVEY

Copy to:
FLENUMMETOC CEN
NAVOCEANO
FLENUMMETOC DET Asheville, NC

**Environmental Effects for Distributed Interactive Simulation
(E²DIS)**

Project and Survey Task Summary

E²DIS. The Defense Modeling and Simulation Initiative of 1 May 1992 identified the creation of synthetic environments as a major goal. Generally, synthetic environments should be capable of providing realistic information about the earth's natural, physical environment. For a synthetic environment to be "realistic," it has to simulate the actual, natural, physical environment (i.e., land, oceans, atmosphere, and near-space) properly in the time and space dimensions (i.e., in the horizontal and vertical).

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2. Develop joint-service standards for environmental data communication protocols.
3. Demonstrate "use cases" for the architecture concept and communication protocols.
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A Memorandum of Agreement establishes the working relationship between DMSO and the E²DIS project team. A Program Development Plan (PDP) describes how the E²DIS goals will be achieved. Eight task areas are defined and detailed descriptions are provided to show how each of these tasks will be executed.

Project team manager for the E²DIS Project is Dr. Harry Heckathorn, Naval Research Laboratory, Washington, D.C., (202) 767-4198.

Enclosure (1)

E²DIS Project

Task 5. Task 5 of the E²DIS project is the Survey of Requirements and Capabilities task, which is divided into three sub-tasks:

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- The *Environment Model and Database Catalog*
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Environmental Effects for Distributed Interactive Simulation

(E²DIS) Project

Capabilities Survey Guidelines

Survey Team. To accomplish the work associated with the Survey Task, the E²DIS Project has selected Science and Technology Corporation (STC) to interface with the Services and other Government agencies. STC Survey Team members include: Dr. Paul Try, John Burgeson, Ken Eis, Carl Chesley, Jerry Johnson, Paul Cooper, and Tom Piwowar.

Survey Procedure.

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Science and Technology Corporation
Attn: Tom Piwowar
409 Third Street, S.W.
Suite 203
Washington, D.C. 20024

Facsimile: (202) 488-5364
Phone: (202) 863-0012

4. Survey Team reviews the returned questionnaires and enters the data in the Project's database.

5. On a case-by-case basis, Survey Team members conduct follow-up telephonic and in-person interviews with technical points-of-contact to clarify questionnaire responses.

Government Point-of-Contact. The Navy and Marine Corps representative for the E²DIS Project's Survey Task is:

Mr. Sam Brand
Naval Research Laboratory
Monterey, CA

Phone: (408) 656-4748 or DSN 878-4748
Facsimile: (408) 656-4769

Mr. Brand should be notified of any issues that might arise during the execution of this survey.

Enclosure (2)

APPENDIX C

DESCRIPTION OF THE CAPABILITIES DATABASE

C.1. STRUCTURE OF DATABASE TABLES

As briefly discussed in Section 2.2.5.1 of the text each database table contains relational information and a common field that allows the tables to be linked together. The primary method of linking various database tables is through the use of an arbitrary, but unique, number assigned to each questionnaire received. Each record (row), or group of records, in a table corresponds to a specific questionnaire; each field (column) corresponds to a specific response, or entry, from a questionnaire. In keeping with sound relational database development theory and practice, the database tables are small in terms of the number of fields. No table has more than 18 fields, and most tables have 10 or less.

Specific items in the Capabilities Questionnaire have been associated with, or mapped into, 23 *Paradox for Windows* database tables. In Table 1 these items are listed and are associated with the appropriate database table. Note that Table 1 is a summary, organized according to the sequence of items in the Capabilities Questionnaire. It also provides reference to Section C.2. in this appendix, where each database table and field is described in detail.

Table 1. Summary of Capabilities Questionnaire Database Tables

| Questionnaire Sections (Appendix A) | Database Table Title | Section C.2. Description Paragraph |
|--|----------------------|---------------------------------------|
| Items A.1., A.2., A.4., and A.5. | ADMINCAP.DB | C.2.1. |
| Item A.3. | EXPERTCAP.DB | C.2.2. |
| Items B.1., B.2., B.3.g., B.4., and B.5.a. | TECHCAP.DB | C.2.3. |
| Items B.3.a.–B.3.f. | APPLICAP.DB | C.2.4. |
| Item B.5.b.(1) Attachment 1, Items C.1.–C.26. (columns 1–3) | CFADECAP.DB | C.2.5. |
| Item B.5.b.(2) Attachment 2, Items C.1.–C.23. (columns 1–3) | CFNSDCAP.DB | C.2.6. |
| Item B.5.b.(3) | OTHDECAP.DB | C.2.7. |
| Item B.5.c. Attachment 3, Items C.1.–C.5. | OTHECAP.DB | C.2.8. |
| Items B.6.a., B.6.b., and B.6.c. Item B.7. | FUTURCAP.DB | C.2.9. |

Table 1. Summary of Capabilities Questionnaire Database Tables (Continued)

| Questionnaire Sections (Appendix A) | Database Table Title | Section C.2. Description Paragraph |
|--|----------------------|---------------------------------------|
| Attachment 1, Items C.1.–C.26. (columns 1 and 4) Attachment 2, Items C.1.–C.23. (columns 1 and 4) | PDATAACAP.DB | C.2.10. |
| Attachment 1, Item D.1. | CAE_SNSR.DB | C.2.11. |
| Attachment 1, Item D.2. | CAE_COMM.DB | C.2.12. |
| Attachment 1, Item D.3. | CAE_WEAP.DB | C.2.13. |
| Attachment 1, Item D.4. | CAE_PLAT.DB | C.2.14. |
| Attachment 1, Item D.5. | CAE_FORC.DB | C.2.15. |
| Attachment 1, Item D.6. | CAE_OTH.R.DB | C.2.16. |
| Attachment 2, Item D.1. | CNSDE_SN.DB | C.2.17. |
| Attachment 2, Item D.2. | CNSDE_CM.DB | C.2.18. |
| Attachment 2, Item D.3. | CNSDE_WS.DB | C.2.19. |
| Attachment 2, Item D.4. | CNSDE_PL.DB | C.2.20. |
| Attachment 2, Item D.5. | FNSDE_FO.DB | C.2.21. |
| Attachment 2, Item D.6. | RNSDE_OB.DB | C.2.22. |
| Attachment 3, Items B.1. and B.2. | SAMEFDLC.DB | C.2.23. |

C.2. DESCRIPTION OF DATABASE TABLES

Each of the 23 database tables is described in detail. The pages and items that are indicated refer to those of the Capabilities Questionnaire.

C.2.1. ADMINCAP.DB. Items A.1., A.2., A.4., and A.5. pertain to ADMINistrative information. Note that Item A.3., the item on Technical Expert, is not included in this database table but is associated with a separate database table (i.e., EXPERT.DB), described in the next paragraph. The first field in ADMIN.DB, the model tracking number, is keyed to and has referential integrity with a similar field in all other database tables except EXPERT.DB. The technical expert may not be unique for each model; in any case, ADMIN.DB and EXPERT.DB can be linked by the last name and first name fields. A description of each

field for this database table follows; this table is the “parent” to the other (“children”) tables. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the model tracking number uniquely assigned to the returned questionnaire.

Field 2 (A.1.) is the title for the simulation model.

Field 3 (A.2.) is the general description of the model.

Field 4 (A.3.a.) is the last name of the technical expert (the same entry as Field 1 in EXPERT.DB).

Field 5 (A.3.a.) is the first name of the technical expert (the same entry as Field 2 in EXPERT.DB).

Field 6 (A.4.) is the service/organization responsible for the model.

Field 7 (A.5.) is the organizational location of the model.

Field 8 is the date the returned questionnaire was received.

C.2.2. EXPERT.DB. Items A.3.a. through A.3.d. are related to the technical EXPERT identified for the simulation model. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 (A.3.a.) is the last name of the technical expert and the first part of the composite key (the same entry as Field 4 in ADMINCAP.DB).

Field 2 (A.3.a.) is the first name of the technical expert and the second part of the composite key (the same entry as Field 5 in ADMINCAP.DB).

Field 3 (A.3.a.) is the middle initial of the technical expert.

Field 4 (A.3.a.) is the rank/title of the technical expert.

Field 5 (A.3.b.) is the organizational title.

Field 6 (A.3.b.) is the first line of the organizational mailing address.

Field 7 (A.3.b.) is the second line of the organizational mailing address.

Field 8 (A.3.b.) is the city of the organizational mailing address.

Field 9 (A.3.b.) is the state of the organizational mailing address.

Field 10 (A.3.b.) is the organization's ZIP code.

Field 11 (A.3.c.(1)) is the office DSN phone number.

Field 12 (A.3.c.(1)) is the office commercial phone number.

Field 13 (A.3.c.(2)) is the office DSN fax number.

Field 14 (A.3.c.(2)) is the office commercial fax number.

Field 15 (A.3.d.) is the E-mail address.

C.2.3. TECHCAP.DB. Items B.1., B.2., B.3.g., B.3.h., B.4., and B.5.a. provide TECHnical CAPabilities information on the model or database. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the keyed (unique) model tracking number.

Field 2 (B.1.a.) describes the most critical environmental issues considered for the model or database.

Field 3 (B.1.b.) describes where these issues are documented.

Field 4 (B.2.) describes the status of the model or database.

Field 5 (B.3.g.) describes the user manual for the model or description of the database, if either is available.

Field 6 (B.3.h.) identifies the primary customer for the model or database.

Field 7 (B.4.a.) describes the primary horizontal surface domain.

Field 8 (B.4.a.) describes the secondary horizontal surface domain.

Field 9 (B.4.b.) describes the primary vertical surface domain.

Field 10 (B.4.b.) describes the secondary vertical surface domain.

Field 11 (B.4.c.(1)) is the typical time period being simulated.

Field 12 (B.4.c.(2)) is the maximum time period being simulated.

Field 13 (B.5.a.(1)) is the type of grid simulation typically used today by the simulation model.

Field 14 (B.5.a.(2)) is the type of map projection typically used today.

Field 15 (B.5.a.(3)) describes other types of grids and map projections.

C.2.4. APPLICAP.DB. Items B.3.a.–B.3.f. provide information on the APPLication CAPabilities of the database or model. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the unique model tracking number.

Field 2 (B.3.a.) describes use in DIS.

Field 3 (B.3.b.) contains the predominant type of simulation.

Field 4 (B.3.b. continued) contains any of the two other types of simulation, if listed.

Field 5 (B.3.c.) contains the predominant of up to six functional uses.

Field 6 (B.3.c. continued) contains the other functional uses (if any).

Field 7 (B.3.d.) contains the predominant of up to five hierarchical levels.

Field 8 (B.3.d. continued) contains the remaining hierarchical levels, if any.

- Field 9 (B.3.e.) contains the predominant of up to four types of applications supported.
- Field 10 (B.3.e. continued) contains the remaining types of applications supported, if any.
- Field 11 (B.3.f.(1)) describes the mission being simulated or modeled.
- Field 12 (B.3.f.(2)) describes the forces being simulated or modeled.
- Field 13 (B.3.f.(3)) describes the platforms being simulated or modeled.
- Field 14 (B.3.f.(4)) describes the weapons systems being simulated or modeled.
- Field 15 (B.3.f.(5)) describes the communications systems being simulated or modeled.
- Field 16 (B.3.f.(6a)) describes the active sensors being simulated or modeled.
- Field 17 (B.3.f.(6b)) describes the passive sensors being simulated or modeled.
- Field 18 (B.3.f.(7)) describes the targets being simulated or modeled.

C.2.5. CFADECAP.DB. Item B.5.b.(1), Current Fidelity Atmospheric Data and Effects CAPabilities, refers to Attachment 1, Items C.1.–C. 26., to identify specific atmospheric data types. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the unique tracking number.

Field 2 (Attachment 1, Item C., column 1) is a keyed (unique) data type. Hence, Fields 1 and 2 make up a composite key. Entries in Field 2 are taken directly from the 26 data types listed in column 1, e.g., low clouds would be entered as 3.e.(3). Thus, each required data type is a unique entry. The following seven fields are associated with each unique data type entry.

Field 3 (first entry of column 3 of Attachment 1, Item C.) is the required horizontal grid spacing.

Field 4 (second entry of column 3 of Attachment 1, Item C.) is the required vertical grid spacing.

Field 5 (third entry of column 3 of Attachment 1, Item C.) is the required time resolution.

Field 6 (fourth entry of column 3 of Attachment 1, Item C.) is the unit of measure for the data type.

Field 7 (first bullet under the fourth entry of column 3 of Attachment 1, Item C.) is the required minimum range.

Field 8 (first bullet under the fourth entry of column 3 of Attachment 1, Item C) is the required maximum range.

Field 9 (second bullet under the fourth entry of column 3 of Attachment 1, Item C) is the required accuracy.

C.2.6. CFNSDCAP.DB. Item B.5.b.(2), Current Fidelity of Near Space Data Capabilities, refers to Attachment 2, Items C.1.–C.23. to identify specific near-space-environment data types. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the unique tracking number.

Field 2 (Attachment 2, Item C, column 1) is a keyed (unique) data type. Hence, Fields 1 and 2 make up a composite key. Entries in Field 2 are taken directly from the 23 data types listed in column 1, e.g., the geomagnetic field strength would be entered as 4.a. Thus, each required near space data type is a separate entry, and the remaining seven fields are associated with it.

Field 3 (Attachment 2, Item C, column 3) is the horizontal grid spacing in meters.

Field 4 (Attachment 2, Item C, column 3) is the vertical grid spacing in meters.

Field 5 (Attachment 2, Item C, column 3) is the required time resolution.

Field 6 (Attachment 2, Item C, column 3) is the unit of measure for the data type.

Field 7 (Attachment 2, Item C, column 3) is the required minimum range.

Field 8 (Attachment 2, Item C, column 3) is the required maximum range.

Field 9 (Attachment 2, Item C, column 3) is the required accuracy.

C.2.7. OTHDECAP.DB. Item B.5.c. provides information on currently required environmental data and environmental effects not covered by items in Attachments 1 and 2 (that is, OTHer Data and Effects CAPabilities). A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the unique model tracking number.

Field 2 (B.5.b.(3)) describes any other required environmental data and/or effects not covered by items in Attachments 1 and 2.

C.2.8. OTHTECAP.DB. Item B.5.c. Attachment 3, Item C. provide information on the OTHer TEchnical CAPabilities. It refers to the grouping of environmental data types identified in Attachment 1, Items C. and D., and the capabilities in Item C. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 (Attachment 3, A.) is the unique tracking number.

Field 3 (Attachment 3, C.1.a.) describes unique scalability capabilities.

Field 4 (Attachment 3, C.2.a.(1)) describes the operating system software compatibility capabilities.

Field 5 (Attachment 3, C.2.a.(2)) describes the programming language compatibility capabilities.

Field 6 (Attachment 3, C.2.a.(3)) describes the database management system software compatibility capabilities.

Field 7 (Attachment 3, C.2.a.(4)) describes the near-term software capabilities changes.

Field 8 (Attachment 3, C.2.b.(1)) describes the hardware system compatibility capabilities.

Field 9 (Attachment 3, C.2.b.(2)) describes whether the hardware system is transportable.

Field 10 (Attachment 3, C.2.b.(3)) describes the data media the system can accept.

Field 11 (Attachment 3, C.3.a.) describes the accessibility with respect to security.

Field 12 (Attachment 3, C.3.b.) describes the accessibility with respect to connectivity capabilities.

Field 13 (Attachment 3, C.4.a.) describes the verification capabilities.

Field 14 (Attachment 3, C.4.b.) describes the validation capabilities.

Field 15 (Attachment 3, C.4.c.) describes the accreditation capabilities.

Field 16 (Attachment 3, C.5.) describes the currency capabilities.

C.2.9. FUTURCAP.DB. Items B.6 and B.7 relate to any changes to current and FUTURre CApabilities resulting from a planned model or database upgrade. These items are also used to discuss whether an upgrade would be considered if currently unavailable environmental data or effects could be provided. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the unique model tracking number.

Field 2 (B.6.b.) describes either the reason for model upgrade or states that none is planned.

Field 3 (B.6.b.(1)(a)) describes the changes to "current capabilities," i.e., those identified in other tables.

Field 4 (B.6.b.(1)(b)) describes the reasons for the changes to "current capabilities."

Field 5 (B.6.b.(2)(a)) describes the new environmental data and effects (ED&E) required as a result of the upgrade and the ED&E whose availability might result in stimulating an upgrade.

Field 6 is a response to either (B.6.b.(2)(b)), a description of the reasons for the new capabilities; or (B.6.c.), a discussion of the potential value of acquiring presently unavailable environmental data or effects.

Field 7 (B.7.) contains the response to an offer to provide a briefing on atmospheric/near-space-environment data and effects.

C.2.10. PDATACAP.DB. Attachments 1 and 2, column 4 of Item C., Potential DATA CAPabilities for specific types. This database table includes both atmospheric (Attachment 1) and near-space (Attachment 2)-environment data capabilities. Data already accounted for in CFADECAP.DB is *not* included here. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the unique tracking number.

Field 2 (Attachment 1, Item C., column 4) is entered with descriptions of any of the 26 atmospheric data types listed in column 1 that have potential for being future capabilities. For example, if there is potential future capabilities for such atmospheric data as blowing dust, fog, rain, and snow, the entry would be 1.c., 5., 8.b.(1), and 8.b.(6).

Field 3 (Attachment 2, Item C., column 4) is entered with descriptions of the near space data types listed in column 1. For example, if there is potential future capabilities for near space data and effects such as diffuse zodiacal infrared emissions, interplanetary solar wind velocity, and meteoroid mass and density, the entry would be 3.a., 5.b.(1), 8.a., and 8.c.

C.2.11. CAE_SNSR.DB. Attachment 1, Item D.1. provides information on the Capabilities for Atmospheric Effects for SeNSoR systems. The database table fields are the same as columns 1 and 2 of Item D.1. If more than one sensor system is described, additional sets of entries are made for each unique sensor system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the tracking number, the first part of the composite key.

Field 2 (Attachment 1, Item D.1.a.) is the second part, i.e., the (unique) name of the sensor system, of the composite key.

Field 3 (Attachment 1, Item D.1.b.) is entered as the energy type(s) associated with the sensor system.

Field 4 (Attachment 1, Item D.1.c.) is entered as the type of sensor.

Field 5 (Attachment 1, Item D.1.d.) is entered as the environmental effect(s) required.

Field 6 (Attachment 1, Item D.1.e.) is entered as the line-of-sight sensor target geometry required.

Field 7 (Attachment 1, Item D.1.f.(1)) is entered as the required sensor altitude range.

Field 8 (Attachment 1, Item D.1.f.(2)) is entered as the target altitude range.

Field 9 (Attachment 1, Item D.1.g.(1)) is entered as the required quiescent environmental conditions.

Field 10 (Attachment 1, Item D.1.g.(2)) is entered as the required disturbed environmental conditions.

C.2.12. CAE_COMM.DB. Attachment 1, Item D.2. provides information on the Capabilities for Atmospheric Effects for COMMunications systems. The database table fields are the same as columns 1 and 2 of Item D.2. If more than one communications system is described, additional sets of entries are made for each unique communications system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the tracking number, of the composite key.

Field 2 (Attachment 1, Item D.2.a.) is the second part, i.e., the (unique) name of the communications system, of the composite key.

Field 3 (Attachment 1, Item D.2.b.) is entered as the energy type(s) associated with the communications system.

Field 4 (Attachment 1, Item D.2.c.) is entered as the environmental effect(s) required.

Field 5 (Attachment 1, Item D.2.d.) is entered as the transmitter-receiver geometry required.

Field 6 (Attachment 1, Item D.2.e.(1)) is entered as the required transmitter altitude range.

Field 7 (Attachment 1, Item D.2.e.(2)) is entered as the receiver altitude range).

Field 8 (Attachment 1, Item D.2.f.(1)) is entered as the required quiescent environmental conditions.

Field 9 (Attachment 1, Item D.2.f.(2)) is entered as the required disturbed environmental conditions.

C.2.13. CAE_WEAP.DB. Attachment 1, Item D.3. provides information on the Capabilities for Atmospheric Effects for WEAPon systems. The database table fields are the same as columns 1 and 2 of Item D.3. If more than one weapon system is described, additional sets of entries are made for each unique

weapon system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 1, Item D.3.a.) is the second part, i.e., the (unique) name of the weapons system, of the composite key.

Field 3 (Attachment 1, Item D.3.b.) describes the required atmospheric effects on the performance of the weapons system.

C.2.14. CAE_PLAT.DB. Attachment 1, Item D.4. provides information on the Capabilities for Atmospheric Effects for PLATforms. The database table fields are the same as columns 1 and 2 of Item D.4. If more than one platform is described, additional sets of entries are made for each unique platform. A description of each field for this database table follows. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 1, Item D.4.a.) is the second part, i.e., the name of the platform, of the composite key.

Field 3 (Attachment 1, Item D.4.b.) describes the required atmospheric effects on the performance of the platform.

C.2.15. CAE_FORC.DB. Attachment 1, Item D.5. provides information on the Capabilities for Atmospheric Effects for FORCs. If more than one force is described, additional sets of entries are made for each unique force. The database table fields are the same as columns 1 and 2 of Item D.5. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 1, Item D.5.a.) is the second part, i.e., the (unique) name of the force, of the composite key.

Field 3 (Attachment 1, Item D.5.b.) describes the required atmospheric effects on the performance of the force.

C.2.16. CAE_OTHR.DB. Attachment 1, Item D.6. provides information on the Capabilities for Atmospheric Effects for any OTHER type systems. The database table fields are the same as columns 1 and

2 of Item D.6. If more than one “other” type system is described, additional sets of entries are made for each unique system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 1, Item D.6.a.) is the second part, i.e., the (unique) name of the other system, of the composite key.

Field 3 (Attachment 1, Item D.6.b.) describes the required atmospheric effects on the performance of the other system.

C.2.17. CNSDE_SN.DB. Attachment 2, Item D.1. provides information on the Capabilities for Near Space Data and Effects for SeNsor systems. The database table fields are the same as columns 1 and 2 of Item D.1. If more than one sensor system is described, additional sets of entries are made for each sensor system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the tracking number, of the composite key.

Field 2 (Attachment 2, Item D.1.a.) is the second part, i.e., the (unique) name of the sensor system, of the composite key.

Field 3 (Attachment 2, Item D.1.b.) is entered as the energy type(s) associated with the sensor.

Field 4 (Attachment 2, Item D.1.c.) is entered as the type of sensor.

Field 5 (Attachment 2, Item D.1.d.) is entered as the environmental effect(s) required.

Field 6 (Attachment 2, Item D.1.e.) is entered as the line-of-sight sensor target geometry required.

Field 7 (Attachment 2, Item D.1.f.(1)) is entered as the required sensor altitude range.

Field 8 (Attachment 2, Item D.1.f.(2)) is entered as the target altitude range.

Field 9 (Attachment 2, Item D.1.g.(1)) is entered as the general state of the required quiescent environmental conditions.

Field 10 (Attachment 2, Item D.1.g.(2)) is entered as the general state of the required disturbed environmental conditions .

C.2.18. CNSDE_CM.DB. Attachment 2, Item D.2. provides information on the Capabilities for Near Space Data and Effects for CoMmunications systems. The database table fields are the same as columns 1 and 2 of Item D.2. If more than one communications system is described, additional sets of

entries are made for each communications system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the tracking number, of the composite key.

Field 2 (Attachment 2, Item D.2.a.) is the second part, i.e., the (unique) name of the communications system, of the composite key.

Field 3 (Attachment 2, Item D.2.b.) is entered as the energy type(s) associated with the communications system.

Field 4 (Attachment 2, Item D.2.c.) is entered as the environmental effect(s) required.

Field 5 (Attachment 2, Item D.2.d.) is entered as the transmitter-receiver geometry required.

Field 6 (Attachment 2, Item D.2.e.(1)) is entered as the required transmitter altitude range.

Field 7 (Attachment 2, Item D.2.e.(2)) is entered as the receiver altitude range.

Field 8 (Attachment 2, Item D.2.f.(1)) is entered as the general state of the required quiescent environmental conditions.

Field 9 (Attachment 2, Item D.2.f.(2)) is entered as the general state of the required disturbed environmental conditions.

C.2.19. CNSDE_WS.DB. Attachment 2, Item D.3. provides information on the Capabilities for Near Space Data and Effects for Weapons Systems. The database table fields are the same as columns 1 and 2 of Item D.3. If more than one weapon system is described, additional sets of entries are made for each weapon system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 2, Item D.3.a.) is the second part, i.e., the (unique) name of the weapons system, of the composite key.

Field 3 (Attachment 3, Item D.3.b.) describes they required near space effects on the performance of the weapons system.

C.2.20. CNSDE_PL.DB. Attachment 2, Item D.4. provides information on the Capabilities for Near Space Data and Effects for PLatforms. The database table fields are the same as columns 1 and 2 of Item D.3. If more than one platform is described, additional sets of entries are made for each platform. A

description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 2, Item D.4.a.) is the second part, i.e., the (unique) name of the platform, of the composite key.

Field 3 (Attachment 2, Item D.4.b.) describes the required near-space effect on the performance of the platform.

C.2.21. CNSDE_FO.DB. Attachment 2, Item D.5. provides information on the Capabilities for Near Space Data and Effects for FOrces. The database table fields are the same as columns 1 and 2 of Item D.5. If more than one force is described, additional sets of entries are made for each force. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 2, Item D.5.a.) is the second part, i.e., the (unique) name of the force, of the composite key.

Field 3 (Attachment 2, Item D.5.b.) describes the required near space effects on the performance of the force.

C.2.22. CNSDE_OT.DB. Attachment 2, Item D.6. provides information on the Capabilities for Near Space Data and Effects for OTher systems. The database table fields are the same as columns 1 and 2 of Item D.6. If more than one “other” type system is described, additional sets of entries are made for each “other” type system. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 is the first part, i.e., the unique tracking number, of the composite key.

Field 2 (Attachment 2, Item D.6.a.) is the second part, i.e., the (unique) name of the (other) object, of the composite key.

Field 3 (Attachment 2, Item D.6.b.) describes the required near space effects on the performance of the object.

C.2.23. SAMEFDLC.DB. Attachment 3, Items B.1. and B.2. provide information on the groupings of environmental data types identified in Attachment 1, Items C and D that have the SAME FiDeLity

Capabilities. A description of each field for this database table is given below. In parentheses after the field number is the relevant item from the Capabilities Questionnaire.

Field 1 (Attachment 3, Item A.) is the unique tracking number (*i.e.*, the same name entered in Field 2 of the ADMINCAP.DB database table), and the first part of the composite key.

Field 2 (Attachment 3, Item B.1.) is the second and final part of the composite key. Entries will be in the form of the letters "C" and "D" followed by numbers indicating groupings of atmospheric environmental data types from Attachment 1.

Field 3 (Attachment 3, Item B.2.) entries are the letters "C" and "D" followed by numbers indicating near-space-environment data types from Attachment 2.

APPENDIX D
DATABASE MANAGEMENT SYSTEM REPORTS

| <u>Report File Name</u> | <u>Report Description</u> |
|-------------------------|--|
| ATMSIDX.RSL | Provides a cross reference between each type of atmospheric data and the models and databases providing that data. |
| CATALOG.RSL | Provides a summarization, sorted by military service owner and tracking number, of the models and databases as shown in Appendix F, which includes a description, point of contact, atmospheric and near space data type capabilities, and associated fidelity capabilities. |
| FIDLMODL.RSL | Provides a listing, sorted by military service owner and tracking number, of the atmospheric data fidelity capabilities of each model and database. |
| LISTCAPB.RSL | Provides a list of surveyed models and databases with their description, environmental issues identified as critical, and point of contact. |
| POT_CABP.RSL | Provides a list of potential future atmospheric data type capabilities of each surveyed model and database. |
| SPACEFDL.RSL | Provides a listing, sorted by military service owner and tracking number, of the near space data fidelity capabilities of each model and database. |
| SPACINDEX.RSL | Provides a cross reference between each type of near space data and the models and databases providing that data. |

APPENDIX E

LIST OF

ENVIRONMENTAL MODELS AND DATABASES

| <u>Service or Agency</u> | <u>Title of Environmental Model or Database</u> ¹ |
|--------------------------|--|
| Air Force: | <ol style="list-style-type: none"> 1. 3DNEPH 6-Monthly 2. 3DNEPH-LMHT/A Hemispheric 3. 5-Layer Cloud Model 4. A Climatological Model for 1-Minute Precipitation Rates 5. AFGL-TR-89-0012, Effects of Rain Attenuation on Satellite EHF Communications in the United States 6. AGRMET 7. Air Combat Targeting/Electro-Optical Simulation (ACT/EOS) 8. Atlas of Cloud-Free Line-of-Sight Probabilities, Parts 1-5: Northern Hemisphere 9. Atmospheric Radiance Code/Auroral Atmospheric Radiance Code (ARC/AARC) 10. Atmospheric Slant Path Analysis Model (ASPM) 11. Boundary Layer Window Analysis 12. Celestial Background Scene Descriptor (CBSD) 13. Clear and Cloud-Free Lines-of-Sight from Aircraft (Addendum) 14. Cloud Scene Simulation Model (CSSM) 15. Combined Radiation and Release Effects Satellite Proton Flux (CRRESPRO) Model 16. Combined Radiation and Release Effects Satellite Space Radiation (CRRESRAD) Model 17. DATSAV2 Aircraft 18. DATSAV2 Rocketsonde 19. DATSAV2 Satellite 20. DATSAV2 Surface 21. DATSAV2 Upper Air 22. Drop-Size Distribution Associated with Intense Rainfall 23. Eighth-Mesh Surface Temperature Analysis 24. Electro-Optical Tactical Decision Aid (EOTDA) 25. Estimating Probabilities of Cloud-Free Fields-of-View from Earth Through the Atmosphere 26. FASCOD3 (to be FASCODE4 or FASE) 27. High Resolution Analysis 28. High Resolution Analysis System/Global Spectral Model (HIRAS/GSM) 29. High Resolution Cloud Prognosis (HRCP) 30. Improved Aurora Precipitation Model (IAPM) 31. Interplanetary Shock Propagation Model 32. Jacchia Atmospheric Density (JAD) Model, 1970 33. Lightning 34. MM5 35. MODTRAN3 (replacing LOWTRAN7) 36. Magnetosphere Specification and Forecast Model |

¹ Models and databases in **boldface** indicate a Capabilities Questionnaire has been received for them, and the data from the questionnaires have been entered into the E²DIS Project Capabilities Survey database.

| <u>Service or Agency</u> | <u>Title of Environmental Model or Database</u> |
|---------------------------|---|
| Air Force: (continued) | <p>37. Military Standard 210C, Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment (MIL-STD-210C)</p> <p>38. Moderate Spectral Atmospheric Radiance and Transmittance (MOSART)</p> <p>39. New Tropical (TRONEW) Cloud Model</p> <p>40. Night Vision Goggle Operations (NOWS)</p> <p>41. Night Vision Goggle Operations (NOWS) Weather Software Database</p> <p>42. PIBAL</p> <p>43. PLEXUS</p> <p>44. Probability-of-Cloud Statistics (C Cloud S)</p> <p>45. RAMS</p> <p>46. RTNEPH 6-Month</p> <p>47. RTNEPH Histogram</p> <p>48. RTNEPH-LMHT/A Hemispheric</p> <p>49. Radiosonde</p> <p>50. Real-Time Nephanalysis (RTNEPH)</p> <p>51. Relocatable Window Model (RWM)</p> <p>52. SHARE and MODTRAN Merged (SAMM)</p> <p>53. Snow Depth (SNODEP)</p> <p>54. Snow Depth Climatology</p> <p>55. Solar Flare Forecast Model</p> <p>56. Solar Wind Transport Model</p> <p>57. Space Environmental Specification and Forecast System (SESFS)</p> <p>58. Strategic High Altitude Radiance Code (SHARC)</p> <p>59. Summary of the Day</p> <p>60. Surface Temperature Model (SFCTMP)</p> <p>61. Synthetic 3-D Atmospheric Temperature: A Model for Known Geophysical Power Spectra Using a Hybrid Autoregression and Fourier Technique</p> <p>62. Upper-Air Window Analysis</p> <p>63. Universal Methods for Estimating Probabilities of Cloud-Free Lines-of-Sight Through the Atmosphere</p> <p>64. Vertical Velocity Analysis</p> <p>65. Winds Aloft</p> |
| Army: | <p>1. AGAUS—A Mie Code</p> <p>2. BITS—Broadband Integrated Transmittances</p> <p>3. CLIMAT—The Climatology Model</p> <p>4. COMBIC—Combined Obscuration Model for Battlefield-Induced Contaminants</p> <p>5. COPTER—Obscuration Due to Helicopter Lofted Snow and Dust Module</p> <p>6. FASCAT—Atmospheric Illumination Module</p> <p>7. FITTE—The Fire-Induced Transmission and Turbulence Effects Module</p> <p>8. GRNADE—Self-Screening Applications Module</p> <p>9. ILUMA—Natural Illumination Under Realistic Weather Conditions</p> <p>10. KWIK—A Munition Expenditures Module</p> <p>11. LASS—Large Area Screening Systems Application Module</p> <p>12. LOWTRN—Atmospheric Transmittance/Radiance Module</p> <p>13. LZTRAN—Laser Transmittance Module</p> <p>14. MPLUME—Missile Smoke Plume Obscuration Code</p> |

| <u>Service or Agency</u> | <u>Title of Environmental Model or Database</u> |
|--------------------------|---|
| Army: (continued) | <p>15. NAPS—Noise Assessment and Prediction System 16. NBSCAT—Narrow Beam Multiple Scattering Module 17. NMMW—Near Millimeter Wave Module 18. NOVAE—Nonlinear Aerosol Vaporization and Breakdown Effects Module. 19. OVRCST—Contrast Transmission Module 20. PEGASUS 21. PFNDAT—Aerosol Phase Function Data Base 22. RADAR—Millimeter Wave System Performance Module 23. REFRAC—Optical Path Bending Code Module 24. SCAPE—Scanning Parabolic Equation 25. SCAPPF—Scanning Fast Field Program Module 26. Smart Weapons Operability Enhancement (SWOE) 27. Spherical—Ground impedance model based on equations by Attenborough 28. Synthetic Environments 29. TARGAC—Target Acquisition Model 30. UVTRAN—An Ultraviolet Transmission and Lidar Simulation Module 31. XSCALE—Natural Extinction Module</p> |
| Navy: | <p>1. Aircraft Icing (AIRICE) 2. Anti-Air Warfare Aircraft Stationing Aid (AAW) 3. Battle Group Vulnerability (BGV) 4. Chaff Corridor Density (CCD) Model 5. Chaff Dispersion and Density (CHADIS) Model 6. Chaff Trajectory Function (CHATRA) Model 7. Chemical/Biological Agent Vapor, Liquid, and Solid (VLSTRACK) Model 8. Composite Area Analysis Model (CAAM) 9. Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) 10. Create Atmospheric Refractive Data Set (CARDS) 11. D-Values 12. Direct Method Evaporation Duct (DMED) Model 13. Electromagnetic (EM) Coverage Diagram (COVER) 14. Electromagnetic (EM) Path Loss vs. Range (LOSS) 15. Electromagnetic Propagation Conditions Summary (PCS) 16. Electronic Countermeasures (ECM) Effectiveness Display 17. Electronic Support Measures (ESM) Range Tables 18. Evaporation Duct Height (EDH) Model 19. Forward-Looking Infrared (FLIR) System Prediction 20. HF Lowest Usable Frequency (HF LUF) 21. HF Maximum Usable Frequency (HF MUF) Program 22. High Frequency Communications (HF COMMS) 23. High Frequency Environmental Acoustics Model (HFEAM) 24. Historical Electromagnetic Propagation Conditions (HEPC) 25. Historical Wind Speed (HWS) 26. Laser Range Prediction (LRP) 27. Meteorological Ballistic Winds and Densities Model (BALWIN) 28. Multivariate Optimum Interpolation (MVOI) 29. Navy Operational Global Atmospheric Prediction System (NOGAPS)</p> |

| <u>Service or Agency</u> | <u>Title of Environmental Model or Database</u> |
|--------------------------|--|
| Navy: (continued) | <p>30. Navy Operational Regional Atmospheric Prediction System (NORAPS)</p> <p>31. Ooyama Analysis</p> <p>32. Orbit Determination Program (ODP)</p> <p>33. Pilot Balloon (PIBAL)</p> <p>34. Platform Vulnerability</p> <p>35. Pressure Altitude/Density Altitude (PADA)</p> <p>36. Radar Free-Space Detection Range (RFSDR)</p> <p>37. Radio Physical Optics (RPO)</p> <p>38. Radiological Fallout (RADFO)</p> <p>39. Radiosonde Initial Analysis (RIA)</p> <p>40. Rowland-Rotter Evaporation Duct Model (RRM)</p> <p>41. Sea-Surface Temperature Analysis and Composite (SSTAC)</p> <p>42. Seakeeping Evaluation Program (SEP) Wind and Wave Database</p> <p>43. Seasonal Cloud Amount and Cloud-Free Line-Of-Sight Data for Oceans</p> <p>44. Ship Ice Accretion (SHIP ICE)</p> <p>45. Solar/Lunar Almanac Program (SLAP)</p> <p>46. Sound Focus (SOCUS)</p> <p>47. Standard Electromagnetic Propagation (Standard EM Prop)</p> <p>48. Rowland-Rotter Evaporation Duct Model (RRM)</p> <p>49. Submarine Technological Environmental (STE) Database—Clouds</p> <p>50. Surface-Search Radar (SRR) Range Table</p> <p>51. Tactical Environmental Knowledge Base System (TEKBS)</p> <p>52. Tactical/Environmental Ship Routing (TESR)</p> <p>53. Temperature Utility (TEMP UTL)</p> <p>54. The OAML Navy Standard Radar Sea Clutter (CLUTTER) Model</p> <p>55. Tomahawk Anti-Ship Missile (TASM) Effective Wind Model</p> <p>56. Tomahawk Environmental Calculation Aid (TECA)</p> <p>57. Tomahawk Land Attack Missile (TLAM) Wind and Temperature Correction</p> <p>58. Tropical Cyclone Module</p> <p>59. Tropospheric Electromagnetic Parabolic Equation Routine (TEMPER)</p> <p>60. Warnings Plot</p> <p>61. Wind Conversion Utility (TRUE WIND)</p> |

APPENDIX F

ENVIRONMENTAL MODELS AND DATABASES

IN THE

CAPABILITIES SURVEY DATABASE

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 501
Model or DB Title Electro-Optical Tactical Decision Aid (EOTDA)
Description Using weather, target, and background information, the EOTDA calculates detection and lock-on range for air-to-ground precision-guided munitions and detection systems operating in the infrared, television, and laser wavelengths.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Lt Col Joseph Alleca
Address-Line 1 PL/GPAA
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2963
E-mail Address alleca@plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | N/A | N/A | 15 min |
| Transmissivity | N/A | N/A | 15 min |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 502
Model or DB Title Night Vision Goggle Operations (NOWS)
Description NOWS uses weather, target, and background information to calculate night vision goggle detection range for air-to-air and air-to-ground scenarios.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Lt Col Joseph Alleca
Address-Line 1 PL/GPAA
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2963
E-mail Address alleca@plh.af.mil

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 503
Model or DB Title Air Combat Targeting/Electro-Optical Simulation (ACT/EOS)
Description ACT/EOS will permit pilots to visualize IR scenes (as seen by the IR weapon/navigator) prior to flight as part of the Air Force Mission Planning System.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Lt Col Joseph Alleca
Address-Line 1 PL/GPAA
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2963
E-mail Address alleca@plh.af.mil

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 504
 Model or DB Title Night Vision Goggle Operations (NOWS) Weather Software Database
 Description The database will be used to validate NOWS.
 Organization Phillips Laboratory Geophysics Directorate
 Point of Contact Lt Col Joseph Alleca
 Address-Line 1 PL/GPAA
 Address-Line 2 29 Randolph Rd.
 Location Hanscom AFB, MA 01731-3010
 Phone Number 617 377-2963
 E-mail Address alleca@plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Aerosols | N/A | | |
| Clouds | N/A | | |
| Dew Point Temperature | N/A | | |
| Fog | N/A | | |
| Humidity | N/A | | |
| Mixing Ratio | N/A | | |
| Precipitation | N/A | | |
| Radiative Features | N/A | | |
| Temperature | N/A | | |
| Visibility | N/A | | |
| Winds | N/A | | |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 505
Model or DB Title FASCOD3 (to be FASCODE4 or FASE)
Description One-by-one "exact" atmospheric radiation/transmittance code at required high spectral resolution for arbitrary slant paths and meteorological conditions to capture detailed Voigt line shape, including non-LTE (nonlocal thermal equilibrium) effects. Accounts for "exact" molecular spectroscopy as it affects radiation propagating through the atmosphere, including absorption, scattering, and emission by/from profiles with a spectral range from UV to microwave and an altitude range from 0 to 120 km. Both laboratory and atmospheric simulations are possible with the user either choosing or accepting defaults of species, clouds, aerosols, etc. FASCOD3 is primarily a remote sensing tool that simulates any high resolution spectral data in the above range (note that solar is excluded).
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Ms. Gail Anderson
Address-Line 1 PL/GPOS
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2335
E-mail Address ganderson@plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------------|------------------|----------------|----------------|
| Aerosols | shell | 10 s m | |
| Clouds | shell | 10 s m | |
| Combat-generated Dust | | | |
| Contrail Formation/Dispersion | | 100 s m | |
| Dew Point Temperature | shell | 10 s m | |
| Fog | shell | 10 s m | |
| Humidity | shell | 10 s m | - |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 505 (Continued)

| <u>Atmospheric Data</u> | <u>Horizontal Scale</u> | <u>Vertical Scale</u> | <u>Temporal Scale</u> |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Mixing Ratio | | | |
| Precipitation | shell | | 100 s m |
| Radiative Features | | | |
| Refractivity | shell | | meters |
| Sea Level Pressure | shell | | |
| Smoke | | 100 s m | |
| Static Pressure | | | |
| Temperature | shell | | |
| Trace Gases | shell | | 10 s m |
| Transmissivity | | 10 s m | |
| Visibility | | | |
| Winds | | | |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

• Tracking No. 506
Model or DB Title MODTRAN3 (replacing LOWTRAN7)
Description MODTRAN3 is a moderate resolution (spectral range 5–50,000 cm⁻¹) atmospheric propagation model and computer code for predicting transmittance and background radiance. The Atmospheric Radiation/Transmittance Algorithm is at 2 cm⁻¹ minimum resolution, covers the spectral range from near UV to the mm region, and includes the effects of molecular and aerosol attenuation. The line-of-sight covers all realistic configurations with spherical geometry and default choices. It is a two-parameter band model with 3% accuracy relative to line-by-line codes. MODTRAN3 provides Voight line shape, has no non-LTE (nonlocal thermodynamic equilibrium) capability, but does have a solar/lunar capability.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Ms. Gail Anderson
Address-Line 1 PL/GPOS
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2335
E-mail Address ganderson@plh.af.mil

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 507
 Model or DB Title Moderate Spectral Atmospheric Radiance and Transmittance (MOSART)
 Description MOSART is a unified, seamless, and scientifically consistent computer code for calculating atmospheric transmission and radiance at low altitudes for line-of-sight paths within the atmosphere and for paths that intersect the earth's surface. MOSART used a band model approach to radiation transport to model low-altitude optical backgrounds and transmission in the ultraviolet region through the microwave spectral region, approximately 0.2 to 50 μm , at a spectral resolution of 2.0 cm^{-1} .
 Organization Phillips Laboratory Geophysics Directorate
 Point of Contact Dr. Laila Jeong
 Address-Line 1 PL/GPOS
 Address-Line 2 29 Randolph Rd.
 Location Hanscom AFB, MA 01731-3010
 Phone Number 617 377-3671
 E-mail Address jeong@plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Aerosols | N/A | 10 s m | N/A |
| Clouds | N/A | 10 s m | N/A |
| Dew Point Temperature | N/A | 10 s m | N/A |
| Fog | N/A | 10 s m | N/A |
| Humidity | N/A | 10 s m | N/A |
| Mixing Ratio | N/A | 10 s m | N/A |
| Precipitation | N/A | 10 s m | N/A |
| Radiative Features | N/A | 10 s m | N/A |
| Refractivity | N/A | N/A | N/A |
| Sea Level Pressure | N/A | N/A | |
| Temperature | 4.5° latitude | 10 s m | N/A |
| Trace Gases | N/A | 10 s m | N/A |
| Transmissivity | N/A | 10 s m | N/A |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 508
Model or DB Title Strategic High Altitude Radiance Code (SHARC)
Description SHARC calculates radiance in the 2–40 μm spectral range at altitudes between 50 and 300 km from active infrared radiators (for example, CO₂, NO, OH, CH₄, H₂O, NO+, and O₃), taking into account the nonequilibrium nature of the sources.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Ramesh Sharma
Address-Line 1 PL/GPOS
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-4198
E-mail Address ramesh@pldec.plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | | none | variable |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 509
Model or DB Title SHARE and MODTRAN Merged (SAMM)
Description SAMM calculates the atmospheric radiance and transmission over the 1- to 40- μ m spectral range, arbitrary LOS, from the surface to 300 km.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Ramesh Sharma
Address-Line1 PL/GPOS
Address-Line2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-4198
E-mail Address ramesh@pldec.plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | none | variable | N/A |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 510
Model or DB Title Synthetic 3-D Atmospheric Temperature: A Model for Known Geophysical Power Spectra Using a Hybrid Autoregression and Fourier Technique
Description Geophysical phenomena are often characterized by smooth continuous power spectra having a domain of negative-slope, power-law dependence. Frequently, Fourier transform analysis has been employed to synthesize scenes from pseudo-random arrays by passing the random samples through a Fourier filter having a desired correlation structure and power density. This model approaches synthesis of three-dimensional synthetic structure by invoking autoregression analysis in conjunction with Fourier methods.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. James Brown
Address-Line 1 PL/GPOS
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-4412

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | 0.1 x 16 km | 100 m | N/A |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 511
 Model or DB Title Cloud Scene Simulation Model (CSSM)
 Description CSSM is a prototype, empirical cloud model developed to support high-fidelity training and simulation applications. TASC has developed CSSM to simulate realistic high-resolution cloud features within domains defined by larger scale weather conditions. Cumulus is the only cloud type currently modeled, but other types, such as cirrus and stratus, will be modeled in the future.
 Organization Phillips Laboratory Geophysics Directorate
 Point of Contact Dr. Joel Mozer
 Address-Line 1 PL/GPAA
 Address-Line 2 29 Randolph Rd.
 Location Hanscom AFB, MA 01731-3010
 Phone Number 617 377-2945
 E-mail Address mozer@plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Aerosols | 1–100 m | 1–100 m | 1–10 min |
| Clouds | 1–100 m | 1–100 m | |
| Precipitation | 1–100 m | 1–100 m | |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 512
Model or DB Title Atmospheric Radiance Code/Auroral Atmospheric Radiance Code (ARC/AARC)
Description ARC/AARC is a set of first-principles short-wave infrared/medium-wave infrared/long-wave infrared (SWIR/MWIR/LWIR) radiance codes designed to model scientific research data and to test performance of other more approximate codes. It calculates nonlocal thermodynamic equilibrium (non-LTE) atmospheric spectral radiance, including airglow, from the undisturbed atmosphere in the altitude range of 30–200 km. At the core of ARC/AARC is a unique algorithm of highly accurate line-by-line (LBL) solution of the non-LTE radiative transfer problem, in both its radiative-excitation and its line-of-sight radiance aspects.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Richard Picard
Address-Line 1 PL/GPOS
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2222
E-mail Address jpicard@plh.af.mil

Specific Capabilities and Fidelity

| <u>Atmospheric Data</u> | <u>Horizontal Scale</u> | <u>Vertical Scale</u> | <u>Temporal Scale</u> |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Nuclear Weapons Effects | ~1000 m | | |
| Transmissivity | N/A | 1000 m | N/A |
| <u>Near Space Data</u> | <u>Horizontal Scale</u> | <u>Vertical Scale</u> | <u>Temporal Scale</u> |
| Auroral Particle | arbitrary | 1000 m | N/A |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 513
Model or DB Title PLEXUS
Description PLEXUS is a suite of atmospheric radiance and transmission codes with a common graphical user interface and an expert system for user assistance.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Frank Clark
Address-Line 1 PL/GPOB
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-4139
E-mail Address fclark@plh.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Radiative Features | | | |
| Refractivity | | | |
| Trace Gases | | | |
| Transmissivity | | | |

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------------------|-------------------------|-----------------------|-----------------------|
| Auroral Particle | | | |
| Diffuse Zodiacal Emission | | | |
| Geomagnetic Field | | | |
| Lunar Parameters | 2 s arc | 2 s arc | N/A |
| Meteoroids and Debris | | | |
| Radio Background Noise | | | |
| Solar Parameters | 2 s arc | 2 s arc | N/A |
| Star and Planetary Positions | 2 s arc | 2 s arc | N/A |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 514
Model or DB Title Combined Radiation and Release Effects Satellite Proton Flux (CRRESPRO) Model
Description CRRESPRO calculates proton and omni-directional fluence and interval omni-directional fluence over the energy range 1–100 MeV for user-specified orbits and quiet, active, or average geophysical conditions.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. M. Gussenhoven
Address-Line 1 PL/GPSP
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-3212
E-mail Address gussen@plh.af.mil

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|----------------------|------------------|------------------|----------------|
| Energetic Parameters | 2° mag lat | 1/20 earth radii | activity level |
| Geomagnetic Storms | | | activity level |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 515
Model or DB Title Combined Radiation and Release Effects Satellite Space Radiation (CRRESRAD)
Model
Description CRRESRAD calculates expected satellite dose accumulation behind four different thicknesses of aluminum shielding for user-specified orbits and quiet or active levels of geophysical activity.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. M. Gussenhoven
Address-Line 1 PL/GPSP
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-3212
E-mail Address gussen@plh.af.mil

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|----------------------|------------------|------------------|----------------|
| Energetic Parameters | 2° mag lat | 1/20 earth radii | activity level |
| Geomagnetic Storms | | | activity level |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 516
Model or DB Title Improved Aurora Precipitation Model (IAPM)
Description The IAPM specifies the location and intensity of auroral precipitation relative to the location of a ground-based C3I system.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. David Hardy
Address-Line 1 PL/GPSG
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-3103

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|-------------------|----------------|----------------|
| Auroral Particle | 2 x 7.5° mag coor | | hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 517
Model or DB Title Interplanetary Shock Propagation Model (ISPM)
Description The ISPM determines the propagation from the sun to the earth of disturbances originating in solar flares and coronal mass ejections. It provides the largest possible leadtime (up to about 4 days) in forecasting conditions of the near-earth space environment resulting from solar activity.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Michael Heinemann
Address-Line 1 PL/GPSG
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2434
E-mail Address heinemann@plh.af.mil

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Geomagnetic Storms | | | |
| Interplanetary Medium | 2 solar radii | 2 solar radii | 10 s |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 518
Model or DB Title Magnetosphere Specification and Forecast Model (MSFM)
Description The MSFM is designed to specify and predict the 0–100 KeV particle and magnetic field environment of the earth's inner and middle magnetosphere. The modeled region is three-dimensional and extends beyond the geostationary orbit.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Michael Heinemann
Address-Line 1 PL/GPSG
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2434
E-mail Address heinemann@plh.af.mil

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Geomagnetic Field | 7.5° | ~3000 km | 15 min |
| Geomagnetic Storms | ~7.5° | ~3000 km | |
| Low Energy Plasma | 7.5° | ~3000 km | 15 min |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 519
Model or DB Title Solar Wind Transport Model (SWTM)
Description The SWTM is designed to model and predict the flow of solar wind from a solar wind sensor located near the Lagrange point to the earth, and simultaneously to model the formation of the shock wave and the magnetopause as the plasma flows past the earth.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Michael Heinemann
Address-Line 1 PL/GPSG
Address-Line 2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2434
E-mail Address heinemann@plh.af.mil

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Geomagnetic Storms | | | |
| Interplanetary Medium | ~2 earth radii | 112,000 km | 10 s |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 520
Model or DB Title Solar Flare Forecast Model (SFFM)
Description The SFFM is based on multivariate discriminant analysis; the SFFM's objective is to generate a probability for a flare of given magnitude to occur in a specified window of time. The forecast window is 24 hr, and the application domain is one solar active region. Output is the "class" (decades of energy level) of the largest flare occurring within a solar active region, ranging over several orders of magnitude, with the lowest class being no flare.
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Dr. Donald Neidig
Address-Line 1 PL/GPSS
Address-Line 2 Sacramento Peak Observatory
Location Sunspot, NM 88349
Phone Number 505 434-7542
E-mail Address neidig@sunspot.noaa.edu

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|---------------------|----------------|----------------|
| Geomagnetic Storms | | | |
| Solar Parameters | solar active region | | |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 521
Model or DB Title AGRMET
Description AGRMET is a near real-time analysis model of surface meteorological conditions and soil conditions at two subsurface levels with ~ 25 nmi horizontal resolution. The AGRMET model output data are delivered to the USDA/Foreign Agriculture Service for its use as input to crop-yield assessment and prediction models.
Organization Air Force Global Weather Central (AFGWC/SYSM)
Point of Contact Capt Kim Waldron
Address-Line 1 MBB 39
Address-Line 2 106 Peacekeeper Drive, Ste 2N3
Location Offutt AFB, NE 68113-4039
Phone Number 402 294-4671
E-mail Address KWALDRON@oafbmail.offutt.af.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Humidity | 47,625 m | N/A | 24 hr |
| Precipitation | 47,625 m | N/A | 24 hr |
| Radiative Features | 47,625 m | N/A | 24 hr |
| Temperature | 47,625 m | N/A | 24 hr |
| Winds | 47,625 m | N/A | 24 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 522
 Model or DB Title Atmospheric Slant Path Analysis Model (ASPM)
 Description ASPAM produces (1) post-analysis profiles of the atmosphere from the surface to 400,000 ft, (2) 1-sigma error estimates of temperature and absolute humidity, and (3) 24-hr surface weather history of a user-selected analysis point, and (4) stratospheric aerosol information.
 Organization Air Force Global Weather Central (AFGWC/SYSM)
 Point of Contact Capt Kim Waldron
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Aerosols | 46 km | 3 layers | N/A |
| Clouds | 46 km | 3 layers | N/A |
| Humidity | N/A | variable | N/A |
| Refractivity | N/A | variable | N/A |
| Sea Level Pressure | N/A | N/A | N/A |
| Temperature | N/A | variable | N/A |
| Visibility | N/A | N/A | N/A |
| Winds | N/A | variable | N/A |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 523
Model or DB Title Five-Layer Cloud Model (FLCM)
Description The FLCM produces medium-resolution hemispheric, excluding the tropics, forecasts of cloud cover and layer clouds.
Organization Air Force Global Weather Central (AFGWC/SYSM)
Point of Contact Capt Kim Waldron
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|--------------------------|----------------|
| Clouds | 190 km | standard pressure levels | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 524
Model or DB Title High Resolution Cloud Prognosis (HRCP)
Description The HRCP generates a short-range, high-resolution forecast of total and layered cloud. It uses a three-dimensional advection scheme, which works well for synoptic systems for the first 9 hr but does not handle cumulus forecasts or stratus formation and dissipation. In addition to RTNEPH cloud data, the HRCP has input of wind trajectory, condensation pressure spread, and dew point information. Forecasts are made in 3-hr time steps to a maximum of 9 hr.
Organization Air Force Global Weather Central (AFGWC/SYSM)
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| Specific Capabilities and Fidelity | | | |
|------------------------------------|------------------|--------------------------|----------------|
| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
| Clouds | 46 km | standard pressure levels | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 525
Model or DB Title High Resolution Analysis System/Global Spectral Model (HIRAS/GSM)
Description The HIRAS and GSM together (1) generate flight-level wind information for computer flight plans, (2) provide analysis and forecast data for the generation of mission-tailored products for use in the field and for regional/theater scale weather analysis and forecast models, and (3) provide uniform gridded data fields (UGDF) to weather units.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Humidity | 278 km | 1810 m | 3 hr |
| Sea Level Pressure | 278 km | N/A | 3 hr |
| Temperature | 278 km | 1864 m | 3 hr |
| Winds | 278 km | 1864 m | 3 hr |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 526

Model or DB Title Real-Time Nephanalysis (RTNEPH)

Description The RTNEPH replaced the 3-dimensional nephanalysis (3DNEPH) as the Air Force Global Weather Central (AFGWC) cloud analysis model in August 1983. Similar to 3DNEPH, the RTNEPH blends high resolution satellite data and conventional data to perform an automated cloud analysis. The vertical structure of the RTNEPH is different, however, having four floating vertical layers that allow greater vertical resolution because the cloud bases and tops are sharply defined. The primary use of the RTNEPH database is to initialize the AFGWC cloud forecast models. Input to the RTNEPH cloud analysis model is primarily single-channel infrared data but also visual data, conventional weather observations, snow data, surface temperatures, and upper-air analyses. The RTNEPH employs a "threshold" method to analyze satellite data. Using the surface temperature database, background brightness, and other empirical corrections, the RTNEPH determines a pixel value for the "cloud/no-cloud" threshold. Any pixels having a value colder (brighter) than the threshold are recorded as indicating a cloud is present. A "clustering" technique determines cloud layers and amounts on an eighth-mesh (25 nmi), polar stereographic grid with up to four floating cloud layers at each grid point.

Organization Air Force Global Weather Central (AFGWC/SYSM)

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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Clouds | 46 km | floating | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 527

Model or DB Title Relocatable Window Model (RWM)

Description The RWM is AFGWC's regional and theater-scale forecast model, limited to three fixed windows (Europe, Asia, and CONUS) and up to four contingency windows. The grid spacing for the fixed windows is 50 nmi and is user-specified for the contingency windows. The forecasts are output as frequently as every 3 hr out to 36 hr. In 1994 the RWM was linked with real-time inputs of snow-ice cover, soil temperature, and soil moisture from other AFGWC-unique models to improve the low level initialization, essential to forecasting accurately initiation of convection and precipitation type. The RWM is run operationally with grid spacing as fine as 25 nmi, small enough to capture many orographic features—in particular the low-level wind fields, which are strongly dependent on accurate depiction of the terrain. The RWM quality is dependent on data availability and accuracy, as well as model limitations. The RWM uses the Global Spectral Model for a first guess field, and then the Relocatable Window Analysis Model searches the database for all observations (including RAOBs, surface observations, and satellite soundings) in or near the window domain to produce a tailored analysis on the model grid. Quality can be seriously impacted in data poor regions.

Organization Air Force Global Weather Central (AFGWC/SYSM)

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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Humidity | 93 km | variable | 3 hr |
| Precipitation | 93 km | N/A | 3 hr |
| Temperature | 93 km | variable | - 3 hr |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|------------------|--|
| Tracking No. | 528 |
| Model/DB Title | Snow Depth (SNODEP) |
| Description | The input to the SNODEP model includes conventional and satellite observations; land, sea, and ice geography; continuity; and snow climatology. SNODEP produces high-resolution global analyses of snow depths and ice cover on an eighth-mesh (25 nmi) grid. The output is reviewed by forecasters and modified, or "bogused," if obvious errors are found in the analysis. |
| Organization | Air Force Global Weather Central (AFGWC/SYSM) |
| Point of Contact | Capt Kim Waldron |
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Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 529
Model or DB Title Surface Temperature Model (SFCTMP)
Description The SFCTMP is designed to analyze and forecast (short-range) worldwide surface temperatures at eighth-mesh (25 nmi) grid points and 3-hourly intervals. Temperatures are modeled at the earth's surface (skin) and shelter height (2 m). Over water, the Navy's sea surface temperature data are interpolated to the SFCTMP grid; the surface and shelter temperatures are assumed to be identical.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | 93 km | 1 m (sfc) | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 530
Model or DB Title New Tropical (TRONEW) Cloud Model
Description TRONEW produces medium-resolution tropical forecasts of cloud cover and low, middle, and high layer amounts.
Organization Air Force Global Weather Central (AFGWC/SYSM)
Point of Contact Capt Kim Waldron
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|-----------------|----------------|
| Clouds | 190 km | low/middle/high | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 531

Model or DB Title DATSAV2 Surface

Description The DATSAV2 Surface Model contains worldwide surface observations (synoptic, airways, METAR, synoptic ship) for about 13,000 stations. All weather elements transmitted are retained; in some cases, computed and derived values are incorporated into the record. Also available are "station files"—individual station data sets for selected stations—that have received more quality control. The elements include wind direction, snowfall and snow depth data, wind speed, runway data, barometric pressures, hail data, pressure tendency and change, sunshine data, dry bulb temperature, ground temperature and conditions, dewpoint temperature, maximum and minimum temperatures, total sky cover, ship data, visibility, sea surface temperature, past and present weather, wave data, cloud layer data, swell data, ceiling, ship ice reports, and precipitation data.

Organization USAFETAC/OL-A

Point of Contact Mr. Jonathan Whiteside

Address-Line 1 151 Patton Ave

Address-Line 2 Room 120

Location Asheville, NC 28801-5002

Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Aerosols | NA | NA | Hourly |
| Atmospheric Electricity | NA | NA | Hourly |
| Clouds | NA | NA | Hourly |
| Dew Point Temperature | NA | NA | Hourly |
| Fog | NA | NA | Hourly |
| Precipitation | NA | NA | Hourly |
| Radiative Features | NA | NA | Hourly |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 531 (Continued)

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Smoke | NA | NA | Hourly |
| Temperature | NA | NA | Hourly |
| Visibility | NA | NA | Hourly |
| Winds | NA | NA | Hourly |
| Winds-Specific Features | NA | NA | Hourly |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 532
 Model or DB Title Summary of the Day—Tape Data Format (TDF)-34
 Description The TDF-34 consists of daily element summaries for 1,795 stations (primarily U.S.-operated) as digitized from original records. Periods of record vary significantly from station to station. Elements included are maximum temperature, minimum temperature, peak wind, precipitation, mean temperature, snowfall, snow depth, and number of days with thunderstorms, snow, sleet, blowing snow, hail rain, dust or sand, fog, smoke or haze.
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 Phone Number 704-271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Aerosols | NA | NA | Hourly |
| Fog | NA | NA | Hourly |
| Precipitation | NA | NA | Hourly |
| Smoke | NA | NA | Hourly |
| Temperature | NA | NA | Hourly |
| Winds | NA | NA | Hourly |
| Winds—Specific Features | NA | NA | Hourly |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 533
Model or DB Title DATSAV2 Satellite
Description Each GOES wind record contains wind direction and speed information at a single pressure level.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Winds | NA | NA | Daily |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 534
Model or DB Title DATSAV2 Rocketsonde
Description The DATSAV2 Rocketsonde consists of rocketsonde observations of height, temperature, pressure, wind direction and speed, and density from an altitude of 20 km to above 90 km.
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Point of Contact Mr. Jonathan Whiteside
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Address-Line 2 Room 120
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Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | NA | NA | Sporadic |
| Winds | NA | NA | Sporadic |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 535
 Model or DB Title DATSAV2 Upper Air
 Description The DATSAV2 Upper Air includes radiosonde, rawinsonde, PIBAL (pilot balloon), and dropsonde observations, with data reaching from the surface to, in some cases, higher than 10 MB. The observations consist of pressure, stability indices, height, temperature, dewpoint temperature, thermal wind direction, thermal wind speed, wind direction, wind speed, maximum winds, mean winds, precipitable water, saturation moisture ration, cloud data, tropopause data, present weather, and freezing levels.
 Organization USAFETAC/OL-A
 Point of Contact Mr. Jonathan Whiteside
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 Location Asheville, NC 28801-5002
 Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Clouds | NA | NA | Hourly |
| Dew Point Temperature | NA | NA | Hourly |
| Static Pressure | NA | NA | Hourly |
| Temperature | NA | NA | Hourly |
| Winds | NA | NA | Hourly |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 536

Model or DB Title DATSAV2 Aircraft

Description The DATSAV2 consists of aircraft reports collected worldwide, with the greatest concentration over the U.S. and along major air routes. Types of reports included are RECCO (reconnaissance observation), COMBAR (combat aircraft report), MAC Abbreviated (Military Airlift Command aircraft report), CODAR (nonreconnaissance aircraft upper-air report), ASDAR (aircraft-satellite data acquisition radar report) AIREPS (aircraft reports), domestic PIREPS (pilot reports), and ICAO (International Civil Aviation Organization report). The archived observations are wind direction, wind speed, D-value, temperature, dew point depression, altitude of mandatory pressure level, frequency of turbulence, intensity of turbulence, type of turbulence cloud and contrail data, icing data, in-flight and off-course weather, flight visibility, and radar data.

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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------------------------|------------------|----------------|----------------|
| Atmospheric Electricity | NA | NA | Sporadic |
| Clouds | NA | NA | Sporadic |
| Contrail Formation and Dispersion | NA | NA | Sporadic |
| Dew Point Temperature | NA | NA | Sporadic |
| Precipitation | NA | NA | Sporadic |
| Temperature | NA | NA | Sporadic |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

* Tracking No. 536 (Continued)

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Visibility | NA | NA | Sporadic |
| Winds | NA | NA | Sporadic |
| Winds—Specific Features | NA | NA | Sporadic |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 537
Model or DB Title PIBAL
Description The TDF-52 consists of foreign PIBAL (pilot balloon) winds (wind speed and wind direction) aloft data for 1,217 stations. The data were digitized from original records and include wind at a varying number of fixed height and/or pressure levels. Periods of record vary significantly from station to station.
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| Specific Capabilities and Fidelity | | | |
|------------------------------------|------------------|----------------|----------------|
| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
| Winds | NA | NA | Sporadic |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 538
Model or DB Title Winds Aloft
Description The TDF-53 contains worldwide winds aloft data for 1,660 stations gathered from PIBAL (pilot balloon), radiosonde, and rawinsonde reports as digitized from original records and other source material. It Includes wind speed and wind direction data for a varying number of fixed height levels. Periods of record vary significantly from station to station.
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Phone Number 704 271-4299

| Specific Capabilities and Fidelity | | | |
|------------------------------------|------------------|----------------|----------------|
| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
| Winds | NA | NA | Sporadic |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 539
Model or DB Title Radiosonde
Description The TDF-54 consists of worldwide radiosonde data (height, relative humidity, temperature, wind direction, pressure, and wind speed) for 1,170 stations as digitized from original records. The data include varying numbers of fixed height and/or pressure levels, including some mandatory levels with periods of records varying significantly from station to station.
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Phone Number 704 271-4299

| Specific Capabilities and Fidelity | | | |
|------------------------------------|------------------|----------------|----------------|
| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
| Humidity | NA | NA | Sporadic |
| Temperature | NA | NA | Sporadic |
| Winds | NA | NA | Sporadic |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 540
Model or DB Title Lightning
Description The lightning database contains lightning stroke information (number of strokes, polarity, peak current signal strength, and relative amplitude) for the continental United States collected through various networks and primarily compiled by GEOMET Data Services. This database is not available for non-DOD customers through the National Climatic Data Center.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Atmospheric Electricity | NA | NA | Sporadic |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 541
 Model or DB Title RTNEPH 6-Month
 Description The RTNEPH 6-Month database consists of cloud and weather information, stored at 6-month intervals, compiled from both conventional surface and upper-air reports and satellite data. Observed clouds are placed within one of four floating layers, with the first layer defined as the highest. The analysis data is on a 512 x 512 subset of the eighth mesh grid and includes data for both hemispheres, eight times a day on each synoptic hour. Each hemisphere is divided into 60 boxes (64x64 grid points in each) on the eighth-mesh grid. The data at a particular grid point may include either zero, one, two, three, or four layers of cloud information, depending on observed conditions. The data consist of cloud type for each of the four layers, percent coverage for each of the four layers, minimum cloud base for each of the four layers, maximum cloud top for each of the four layers, total cloud coverage, present weather report, visibility report, and data age and source information.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Aerosols | 25 NM | 4 layers | 3 hr |
| Clouds | 25 NM | 4 layers | 3 hr |
| Fog | 25 NM | 4 layers | 3 hr |
| Precipitation | 25 NM | 4 layers | 3 hr |
| Visibility | 25 NM | 4 layers | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 542
Model or DB Title RTNEPH Histogram
Description The RTNEPH histogram contains low, middle, and high cloud types and amounts (LMHT/A), plus total cloud coverage derived from the RTNEPH database. Analyses are on a 512 x 512 subset of the eighth-mesh grid and include data for both hemispheres eight times a day on each synoptic hour. The LMHT/A histogram file consists of a frequency distribution of the number of days by month and hour each element falls within specified limits. The elements are total cloud amount, low cloud type and amount, middle cloud type and amount, and high cloud type and amount.
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Phone Number 704 271-4299

| Atmospheric Data | Specific Capabilities and Fidelity | | |
|------------------|------------------------------------|----------------|----------------|
| | Horizontal Scale | Vertical Scale | Temporal Scale |
| Clouds | 25 nmi | 4 layers | 3 hr |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 543
Model or DB Title RTNEPH-LMHT/A Hemispheric
Description The LMHT/A database contains low, middle, and high cloud types and amounts, plus total cloud coverage derived from the RTNEPH database. Analyses are on a 512 x 512 subset of the eighth-mesh grid and include data for both hemispheres eight times a day on each synoptic hour. Data elements include total cloud amount, low cloud type and amount, middle cloud type and amount, and high cloud type and amount.
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Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Clouds | 25 nmi | 4 layers | 3 hr |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 544
Model/DB Title 3DNEPH 6-Monthly
Description The 3DNEPH 6-Monthly database consists of cloud information, stored at 6-month intervals, compiled from conventional surface and upper-air reports and satellite data. Observed clouds are placed in 1 of 15 fixed thickness layers. The first 6 layers are between the surface and 3,500 ft above ground level; the remaining nine levels are between 3,500 and 40,000 ft above sea level. Analyses are on a 512 x 512 subset of the eighth mesh grid. They include data for both hemispheres, eight times a day on each synoptic hour (but only 03, 09, 15, and 21 Z for Southern Hemisphere data from January 1977 through July 1978). Each hemisphere is divided into 60 boxes (64x64 grid points in each) on the eighth-mesh grid. The database contains percent cloud coverage for each of the 15 layers, low cloud type, middle cloud type, high cloud type, total cloud coverage, minimum cloud base, maximum cloud top, and the present weather report.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Aerosols | 25 nmi | 15 layers | 3 hr |
| Clouds | 25 nmi | 15 layers | 3 hr |
| Fog | 25 nmi | 15 layers | 3 hr |
| Precipitation | 25 nmi | 15 layers | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 545
Model or DB Title 3DNEPH-LMHT/A Hemispheric
Description The LMHT/A Hemispheric database is derived from the 15 fixed-layer 3DNEPH database and consists of total cloud amount, low cloud type and amount, middle cloud type and amount, and high cloud type and amount. Analyses are on a 512 x 512 subset of the eighth-mesh grid and include data for both hemispheres eight times a day on each synoptic hour (but only 03, 09, 15, and 12 Z for Southern Hemisphere data).
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Aerosols | 25 nmi | 15 layers | 3 hr |
| Clouds | 25 nmi | 15 layers | 3 hr |
| Fog | 25 nmi | 15 layers | 3 hr |
| Precipitation | 25 nmi | 15 layers | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 546
 Model or DB Title High Resolution Analysis
 Description The HIRAS database consists of surface to upper-air analyses data on the 2.5 x 2.5-degree grid. Each analysis includes all mandatory pressure levels (surface, 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, and 10 mb). Analysis times are 00 Z, 06 Z, 12 Z, and 18 Z. The database is subdivided into five regions by latitude belt. Although HIRAS is the primary model, the MULTAN model is used for moisture analyses. Data source include conventional surface observations, upper-air soundings, and satellite data. The data elements are temperature, dew point depression, specific humidity, relative humidity, sea-level pressure, U-wind component, V-wind component, D-value, precipitable water, tropopause pressure, tropopause height, tropopause temperature, and vorticity.
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Clouds | 2.5x2.5 | 16 levels | 6 hr |
| Dew Point Temperature | 2.5x2.5 | 16 levels | 6 hr |
| Humidity | 2.5x2.5 | 16 levels | 6 hr |
| Sea Level Pressure | 2.5x2.5 | 16 levels | 6 hr |
| Temperature | 2.5x2.5 | 16 levels | 6 hr |
| Winds | 2.5x2.5 | 16 levels | 6 hr |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 547
Model or DB Title Eighth-Mesh Surface Temperature Analysis
Description The surface temperature analysis consists of analyses of surface temperatures (in Kelvin to tenths) on a 512 x 512 subset of the eighth-mesh grid. It is produced eight times daily on each synoptic hour. Analyses serve as background data for comparison with new satellite data to locate relatively cold areas that represent clouds. Analyses use latest surface observations and synoptic reports updated every 3 hr for land areas and every 12 hr (or more) for ocean areas. Temperatures represent ambient air temperatures over land and sea surface temperatures over the ocean.
Organization USAFETAC/OL-A
Point of Contact Mr. Jonathan Whiteside
Address-Line 1 151 Patton Ave
Address-Line 2 Room 120
Location Asheville, NC 28801-5002
Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | 25 nmi | 15 layers | 3 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|--|
| Tracking No. | 548 |
| Model or DB Title | Boundary Layer Window Analysis (BLWA) |
| Description | The BLWA consists of boundary layer window analyses on the half-mesh grid for Asia, Europe, and the United States. Analysis times are 00 Z and 12 Z. Window sizes are 29 x 27 for the United States and 29 x 35 for Asia and Europe. Each grid point consists of data for the following eight levels: surface, 50, 150, 300, 600, 900, 1,200, and 1,600 m above ground level. Data sources include conventional surface reports and upper air soundings. The data elements are U-wind component, V-wind component, W-wind component, temperature, D-value, height above mean sea level, specific humidity, specific moisture, relative humidity, U-component of fractional wind field, and the V-component of fractional wind field. |
| Organization | USAFETAC/OL-A |
| Point of Contact | Mr. Jonathan Whiteside |
| Address-Line 1 | 151 Patton Ave |
| Address-Line 2 | Room 120 |
| Location | Asheville NC 28801-5002 |
| Phone Number | 704 271-4299 |

Specific Capabilities and Fidelity

| <u>Atmospheric Data</u> | <u>Horizontal Scale</u> | <u>Vertical Scale</u> | <u>Temporal Scale</u> |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Humidity | 103 nmi | 8 layers | 2 hr |
| Temperature | 103 nmi | 8 layers | 2 hr |
| Winds | 103 nmi | 8 layers | 2 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 549
 Model or DB Title Upper-Air Window Analyses (UAWA)
 Description The UAWA and a surface analysis are stored on the half mesh grid for Asia, Europe, and North America. Analyses times are 00 Z and 12 Z. Window sizes are 37 x 39 for North America and 35 x 41 for Asia and Europe. Each North American grid point has data for 11 levels: surface, 1000, 850, 700, 500, 400, 300, 250, 200, 150, and 100 mb. Each Asian and European grid point has data for six levels: surface, 1,000, 850, 700, 500, and 300 mb. Two stability indices also included: Total-Totals and SWEAT index. Data sources include conventional surface reports, upper air soundings, and satellite data. The data elements are U-wind component, V-wind component, D-value, temperature, dew point depression, surface pressure, Total-Totals index, and the SWEAT index.
 Organization USAFETAC/OL-A
 Point of Contact Mr. Jonathan Whiteside
 Address-Line 1 151 Patton Ave
 Address-Line 2 Room 120
 Location Asheville, NC 28801-5002
 Phone Number 704 271-4299

Specific Capabilities and Fidelity

| <u>Atmospheric Data</u> | <u>Horizontal Scale</u> | <u>Vertical Scale</u> | <u>Temporal Scale</u> |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Dew Point Temperature | 103 nmi | 11 layers | 2 hr |
| Static Pressure | 103 nmi | 11 layers | 2 hr |
| Temperature | 103 nmi | 11 layers | 2 hr |
| Winds | 103 nmi | 11 layers | 2 hr |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 550
Model or DB Title Vertical Velocity Analysis
Description Consists of vertical velocity analyses (in millibars per second) on the whole-mesh octagon grid. Analyses available north of about 20°N latitude and south of about 20°S latitude for hours of 00 Z and 12 Z. Data sources are upper-air observations. Levels included are 850 mb, 700 mb, 500 mb, 300 mb, 200 mb, and 150 mb. Available from the High Resolution Analysis for the time period after 1988.
Organization USAFETAC/OL-A
Point of Contact Mr. Jonathan Whiteside
Address-Line 1 151 Patton Ave
Address-Line 2 Room 120
Location Asheville, NC 28801-5002
Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Winds | 206 nmi | 6 layers | 12 hr |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 551
Model or DB Title Snow Depth Climatology
Description This product provides mean monthly snow depth values on the polar stereographic one-eighth mesh grid (approximately 25 nmi spacing) over the entire globe.
Organization USAFETAC/OL-A
Point of Contact Mr. Jonathan Whiteside
Address-Line 1 151 Patton Ave
Address-Line 2 Room 120
Location Asheville, NC 28801-5002
Phone Number 704 271-4299

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | 25 nmi | NA | Daily |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 554
 Model or DB Title Jacchia Atmospheric Density (JAD) Model, 1970
 Description The JAD Model provides the neutral density atmosphere density for the special perturbation (e.g., Gauss-Jackson) orbit determination model and semi-analytical (e.g., SALT) orbit determination models. These models are used only for high-interest satellites and re-entering debris, which make up only a small percentage (~1%) of the cataloged satellite population.
 Organization Space Warfare Center (SWC)/SAA
 Point of Contact Mr. Mark Storz
 Address 730 Irwin Ave.
 Location Falcon AFB, CO 80911-7300
 Phone Number 719 380-3550
 E-mail Address storzmf@fafb.af.mil

Specific Capabilities and Fidelity

| <u>Near Space Data</u> | <u>Horizontal Scale</u> | <u>Vertical Scale</u> | <u>Temporal Scale</u> |
|------------------------|-------------------------|-----------------------|-----------------------|
| Geomagnetic Field | N/A | N/A | 5400 s |
| Solar Parameters | N/A | N/A | 86400 s |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 555
 Model or DB Title Space Environmental Specification and Forecast System (SESFS)
 Description The SESFS is a system of coupled space models to produce the specification and forecasts (hours through years) of solar, ionospheric, and geomagnetic parameters that effect high-frequency communications and satellite communications. The M&S effort is also used for near real-time and post analysis of radar signatures, satellite anomalies, and communication descriptions.
 Organization 50 Weather Squadron
 Point of Contact Mr. Kevin Sro
 Address 715 Keplar Ave.
 Location Falcon AFB, CO 80912-7160
 Phone Number 719 567-6332

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|---------------------------|---------------------|----------------|----------------|
| Radiative Features | 5000 | N/A | 300 s |
| Refractivity | 100 km | 10 km | 1800 s |
| <hr/> | | | |
| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
| Auroral Particle | 0.5° | N/A | 1 s |
| Cosmic Rays | N/A | N/A | 1 s |
| Energetic Parameters | 1 ° deg solid angle | 500,000 m | 300 s |
| Geomagnetic Storms | N/A | N/A | 900 s |
| Interplanetary Medium | 100,000 m | N/A | 900 s |
| Low Energy Plasma | 10,000 m | 10,000 m | 1800 s |
| Neutral Environment | 25,000 m | 3,000 m | 3600 s |
| Polar Cap Absorption | 10,000 m | N/A | 900 s |
| Solar Parameters | N/A | N/A | 1 day |
| Sporadic E | 10,000 m | 3,000 m | 900 s |
| Sudden Ionospheric Storms | N/A | N/A | 900 s |

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 556
 Model or DB Title Celestial Background Scene Descriptor (CBSD)
 Description The CBSD is a model of the sun, moon, planets, and zodiacal emissions, which include bands, asteroids, stars, and H II regions. Positional accuracy is 2 arc seconds.
 Organization Phillips Laboratory Geophysics Directorate
 Point of Contact Dr. Frank Clark
 Address-Line 1 PL/GPOB
 Address-Line 2 29 Randolph Rd.
 Location Hanscom AFB, MA 01731-3010
 Phone Number 617 377-4139
 E-mail Address fclark@plh.af.mil

Specific Capabilities and Fidelity

| Near Space Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------------------|------------------|----------------|----------------|
| Diffuse Zodiacal Emission | any | any | any |
| Lunar Parameters | | | |
| Meteoroids and Debris | any | any | any |
| Neutral Environment | any | any | any |
| Solar Parameters | any | any | any |
| Star and Planetary Positions | any | any | any |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 557

Model or DB Title AFGL-TR-89-0012, Effects of Rain Attenuation on Satellite EHF Communications in the United States

Description AFGL-TR-89-0012 provides estimates of the frequency of occurrence, duration, and probability of satellite EHF communication outages due to attenuation by rain. These can be used to determine optimum frequencies, power levels, and the need for space diversity of terminals or other alternatives to maintain reliable communications. Ten years of 1-min rain rates at each of 42 United States cities were used in conjunction with an attenuation model to quantify communication outages at locations representing a variety of climatic regimes. Analyses of the 1-min rain rates and outage estimates at 15, 30, and 45 GHz for elevation angles of 10°, 30°, 50°, and 70° are presented. The results show the profound influence of propagation path elevation angle on the quantity and duration of outages.

Organization Phillips Laboratory Geophysics Directorate

Point of Contact Mr. Paul Tattelman

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Address-Line 2 29 Randolph Rd.

Location Hanscom AFB, MA 01713-3010

Phone Number 617 377-5956

Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 558
Model/DB Title A Climatological Model for 1-min Precipitation Rates
Description The article (Journal of Applied Meteorology, Vol. 34. No. 5, May 1995) describes a model for estimating mean monthly total time occurrence for 1-min precipitation rates from monthly climatological variables. The model has two components: an estimation algorithm for the mean monthly percentage of time in which precipitation occurs and a set of algorithms to derive the mean cumulative distribution function of precipitation rates for a calendar month. Both components were developed using stepwise linear regression analysis applied to a database containing 10 yr of 1-min precipitation data from 34 sites throughout the 48 contiguous states of the United States. The required climatological variables are mean monthly temperature range, mean monthly precipitation, and mean number of days per month with precipitation (based on three commonly used threshold values to define a day with precipitation).
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Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 559

Model or DB Title Drop-Size Distribution Associated with Intense Rainfall

Description Willis and Tattleman (Journal of Applied Meteorology, Vol. 28, No. 1, January 1989) review the probability of occurrence of extreme rainfall rates. The drop-size distributions associated with a range of high rainfall rates are examined using data from tropical storms and hurricanes. Mean drop-size distributions are presented for a range of high rainfall rates, as well as a Gamma distribution to fit the entire set of normalized drop-size distributions. This fit forms the basis for a model drop-size distribution for intense rain. The goodness of fit of the model is examined by comparing it with independent drop-camera measurements of high-rain-rate distributions from several geographic locations. The slope of exponential fits to the distributions are examined for constancy with rainfall rate and are generally found to decrease with increasing rainfall rate.

Organization NOAA/AOML

Point of Contact Mr. Paul Willis

Address-Line 1 Hurricane Research Division

Location Miami FL 33149

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 560 |
| Model or DB Title | Military Standard 210C, Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment (MIL-STD-210C) |
| Description | Military Standard 210C superseded MIL-STD-210B in January 1987 to include not only worldwide data but also regional climatic data. The data provided are intended to serve as natural environmental starting points for the sequence of engineering analyses to derive environmental design criteria for military material. The current standard provides climatic information for land, sea, and air environments in which military material may be required to operate. The information is generally presented in the form of frequencies of occurrence; however, long-term climatic extremes are also provided for most climatic elements. |

Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 561

Model or DB Title Universal Methods for Estimating Probabilities of Cloud-Free Lines-of-Sight Through the Atmosphere

Description The paper describes how more than 3 years of 3-hr high-contrast whole-sky photographs, sky-cover observations, and cloud-type observations were utilized to develop two methods for estimating cloud-free line-of-sight probabilities through the entire atmosphere between the surface of the earth and space for any desired geographical location. One method requires a knowledge of the probability of each sky-cover category (tenths or eighths); the other method requires sky-cover and cloud-type information.
See I. A. Lund and M. D. Shanklin, 1973: Universal methods for estimating probabilities of cloud-free lines-of-sight through the atmosphere, *Journal of Applied Meteorology*, Vol. 12, No. 1, February 1973, pp. 28–35.

Organization Phillips Laboratory Geophysics Directorate

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Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 562

Model or DB Title Estimating Probabilities of Cloud-Free Fields-of-View (CFFOV) From the Earth Through the Atmosphere

Description The paper describes a model for estimating the probability of obtaining a cloud-free field-of-view for earth-to-space viewing application as a function of ground-observer-reported total sky cover. The development of the model and examples of its application are described. The model extends the work of Lund and Shanklin (1972, 1973) on cloud-free lines-of-sight by presenting probabilities of the CFFOV. Examples of the types of questions bearing on the CFFOVs addressed in this study are: What is the probability that there will be a CFFOV directly overhead, from the earth's surface to space, if the FOV width is 10°? How does the probability change as the FOV is widened? What is the probability that at least half of the FOV will be cloud-free? How does it change if the FOV axis is moved off the zenith? How do these CFFOV results compare to the CFLOS results published earlier?
See I. A. Lund and D. D. Grantham, 1980: Estimating probabilities of cloud-free fields-of-view from the earth through the atmosphere, Journal of Applied Meteorology, Vol. 19, No. 4, pp. 452-463, April 1980.

Organization Phillips Laboratory Geophysics Directorate

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Air Force

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 563
Model or DB Title Clear and Cloud-Free Lines-of-Sight From Aircraft (Addendum)
Description AFGL-TR-77-0141 (Addendum), 8 August 1977 (Reprinted 6 September 1983) by Eugene A. Bertoni, provides estimates of probability of clear, cloud-free, and hazy lines-of-sight to and from aircraft at altitude. This report allows the following types of questions to be answered: What is the probability of seeing an object on the ground from various altitudes, in specified geographical areas and at different seasons? How high must one fly to be 98% confident of being above all clouds? What is the probability of successful IR or optical detection of an aircraft or surface target from an aircraft flying above all clouds?
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Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 564

Model or DB Title Atlas of Cloud-Free Line-of-Sight Probabilities, Parts 1-5: Northern Hemisphere

Description These atlases provide probabilities of cloud-free lines-of-sight between earth and space. The probabilities are for mid-season months: January, April, July, and October; four times a day: 0000-0200 LST, 0600-0800 LST, 1200-1400 LST, and 1800-2000 LST; and three elevation angles: 10°, 30°, and 90°. Parts 1, 2, 3, 4, and 5 depicted cloud-free line-of-sight probabilities for Germany, the U.S.S.R., the U.S.A., Europe, and North Africa and the Middle East, respectively.

See I. A. Lund, D. D. Grantham, and C. B. Elam, Jr., "Atlas of Cloud-Free Line-of-Sight Probabilities", Parts 1-5:

Part 1: Germany. AF Surveys in Geophysics No. 309, AFCRL-TR-0261, 77 pp., May 1975.

Part 2: Union of Soviet Socialist Republics, AF Surveys in Geophysics No. 358, AFGL-TR-77-005, 63 pp., December 1976.

Part 3: United States of America, AF Surveys in Geophysics No. 374, AFGL-TR-77-188, 73 pp., August 1977.

Part 4: Europe, AF Surveys in Geophysics No. 400, AFGL-TR-78-0276, 71 pp., November 1978.

Part 5: North Africa and the Middle East, AF Surveys in Geophysics No. 417, AFGL-TR-79-0275, 67 pp., November 1979.

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Air Force
E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 566
Model or DB Title Probability-of-Cloud Statistics (P Cloud S)
Description P Cloud S is a PC-based, compact global cloud climatology model of total sky cover (not clouds at a given altitude). The following statistics together with estimated errors are available for any point on the earth, any time of year, and any time of day in the form of numbers, graphs, histograms, or maps: Sky Cover (probability of given fraction, duration category, recurrence category, and conditional climatology); Cloud-Free Line-of-Sight (probability of CFLOS, duration of CFLOS, recurrence of CFLOS, and joint probability of CFLOS at N sites); Satellite-based Viewing (cloud coverage over an area and cloud coverage over a line); and Database Parameters (mean sky cover, sky dome mean correlation, large area mean correlation, and effective period of record).
Organization Phillips Laboratory Geophysics Directorate
Point of Contact Mr. Albert Boehm
Address-Line1 PL/GPAA (HSTX)
Address-Line2 29 Randolph Rd.
Location Hanscom AFB, MA 01731-3010
Phone Number 617 377-2971
E-mail Address boehm@plh.af.mil

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 601
Model or DB Title PEGASUS
Description The PEGASUS Perspective View Database (PVDB) is a geographic database containing elevation data, gray shades taken from aerial photographs, vegetation heights, and other information required for perspective view generation. The PVDB is available in four resolutions: 1, 4, 16, and 64 m. The Fort Hunter-Liggett (FHL) PVDB covers a rectangular area on the ground measuring 32 x 28 km.
Organization Computer Science Department
Point of Contact Dr. Wolfgang Baer
Address-Line 1 Naval Postgraduate School
Location Monterey, CA 93943
Phone Number 408 656-2209
E-mail Address baer@cs.nps.navy.mil

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 609
Model or DB Title Synthetic Environments (SE)
Description SE introduces within the synthetic theater of war (STOW-97) improved entity resolution and performance; environmental representations; and integrated, distributed live, virtual, and constructive simulations. SE develops knowledge-based, semi-autonomous forces and faster database builds.
Organization Topographic Engineering Center
Point of Contact Mr. Jack Huntley
Address-Line 1 Attn: CETEC-TD-SM (Huntley)
Address-Line 2 7701 Telegraph Rd.
Location Alexandria, VA 22315-3864
Phone Number 703 355-2651
E-mail Address jhuntley@tec.army.mil

Army

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 610 |
| Model or DB Title | Smart Weapons Operability Enhancement (SWOE) |
| Description | The SWOE provides environmental and target radiometric information at the aperture of an electro-optical sensor. The model also has the capability to simulate the sensor transform function. The SWOE program has also collected and developed an extensive environmental database consisting of MWIR (3–5 μm), LWIR (8–12 μm), and MMW (95.0 GHz) imagery from both ground and airborne platforms for Grayling, MI, during the fall and winter, and at Yuma, AZ, during the spring. The total database is larger than one terabyte. |
| Organization | CRREL |
| Point of Contact | Dr. George Koenig |
| Address-Line 1 | CECRL-SW |
| Address-Line 2 | 72 Lyme Rd. |
| Location | Hanover, NH 03755 |
| Phone Number | 603 646-4556 |
| E-mail Address | gkeonig@crrel41.usace.army.mil |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 612

Model or DB Title BITS-Broadband Integrated Transmittances

Description BITS calculates transmittances for systems having a broad spectral response. Path-integrated concentration data from COMBIC calculations or other EOSAEL models can be used as input to BITS. The primary function of BITS is to provide rigorous transmittance calculations for broadband systems, replacing the Lambert-Beer law used in most obscuration calculations. The user of the model must define the system detector, filter, optics, and source spectral functions. The spectral transmittance of the atmosphere and the mass-extinction-coefficient spectral data for the obscurant are also needed for BITS calculations. The output of BITS is the resulting transmittance as a function of concentration length for Beer's law and the band-averaged computational methods. Details about the model are described in the Users Guide by Davis and Berrick. The rationale for developing this model was that errors in using the simple Lambert-Beer law could result in the accumulation of errors in transmittances for war games, and so change the outcome of such war games.

Organization US Army Research Laboratory

Point of Contact Dr. Alan Wetmore

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Address-Line 2 2800 Powder Mill Road

Location Adelphi, MD 20783

Phone Number 301 394-1360

E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 613
Model or DB Title CLIMAT—The Climatology Model
Description CLIMAT is a support module used by several of the other EOSAEL models. It can also be used to describe the climatological aspects of a region. The CLIMAT database is built from meteorological data from hundreds of Air Force and other stations and is averaged and statistically manipulated to give predictive meteorology for 74 areas throughout the world. These areas are Central Europe (1–4), Mid-East (5–10), Korea (11–13), Alaska (14–16), Scandinavia (17–18), Central America (19–21), Mexico (22–25), South America (26–31), India (32–34), Southeast Asia (35), Southern Europe (36–47), and Canada and U.S.A. 48–74). Three-hourly observations from 1965 to the present were used to compute the climatology data for the regions. CLIMAT contains conditional statistics based on prevailing weather conditions. The seasons were determined from time changes in these conditional statistics.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Clouds | 100 km | N/A | 6 hr |
| Dew Point Temperature | 100 km | N/A | 6 hr |
| Humidity | 100 km | N/A | 6 hr |
| Precipitation | 100 km | N/A | 6 hr |
| Sea Level Pressure | 100 km | N/A | – 6 hr |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 613 (Continued)

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | 100 km | N/A | 6 hr |
| Visibility | 100 km | N/A | 6 hr |
| Winds | 100 km | N/A | 6 hr |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 614
Model or DB Title COMBIC—Combined Obscuration Model for Battlefield Induced Contaminants
Description COMBIC predicts the reduction in transmission of electromagnetic energy at visual, near-infrared, and far-infrared wavelengths due to airborne dust, smoke, and debris added to a battlefield environment, and obscurant sources for arbitrary times after cloud formation. Vehicular dust is also included.
Organization US Army Research Laboratory
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Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Combat-generated Dust | 1 m | 1 m | 1 s |
| Smoke | 1 m | 1 m | 1 s |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 615
Model or DB Title COPTER—Obscuration Due to Helicopter Lofted Snow and Dust Module
Description COPTER models obscuration produced by helicopter lofted snow and dust, based on a combination of helicopter downwash models and models of obscuration by blowing snow. The helicopter can be traveling across the line of sight or parallel to the line of sight. Broadband transmission is calculated for the visible and scaled to the infrared and millimeter wave regions. Outputs are minimum transmission and time periods when transmission is less than 5% for all wave bands.
Organization US Army Research Laboratory
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Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 616
Model or DB Title FASCAT-Atmospheric Illumination Module
Description FASCAT is a two-stream approximate radiative transfer model. The model was mainly developed by the US Air Force and Navy, and this version was especially adapted for the US Army EOSAEL. The reason for using an approximate radiative transfer model is to make quick but reasonably accurate path radiance or contrast calculations. A model of this type can be used to calculate a quantity called sky-to-ground ratio that is used in war games considering visual or near visual devices. The atmosphere is characterized in layers that have specified absorption and scattering characteristics. Phase functions for the aerosols are built into the block data routine within FASCAT.
Organization US Army Research Laboratory
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | 10 m | 10 m | 10 min |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 617

Model or DB Title FITTE—The Fire Induced Transmission and Turbulence Effects Module

Description The FITTE and FGLOW models provide relatively rapid calculations of the effects of battlefield fires on detection, laser-designator, and weapon systems. FITTE predicts transmittance through fire plumes, path radiance from fires or fire plumes and (optionally) effects of fire or fire plume turbulence on laser propagation for a given line of sight. The fires represent localized sources of burning diesel fuel, motor oil, and rubber, i.e., simulated burning vehicles. FITTE also predicts the line-of-sight path-integrated particle concentration, and if a target temperature is specified, the attenuated thermal radiance from the target at the observer position. If the calculation is performed for a single wavelength, the model predicts beam spread and wander on a laser beam of that wavelength. The FGLOW option performs calculations for a set of lines of sight and creates a file of path radiance values, which represent the radiant image that would be seen by an imaging system, and of transmittance values, which represent the attenuation of the background image. An option allows output of an apparent temperature image.

Organization US Army Research Laboratory

Point of Contact Dr. Alan Wetmore

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Address-Line 2 2800 Powder Mill Road

Location Adelphi, MD 20783

Phone Number 301 394-1360

E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | 10 m | 10 m | 10 min |
| Smoke | 1 m | 1 m | 1 s |
| Transmissivity | 1 m | 1 m | — 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 618
Model or DB Title GRNADE—Self-Screening Applications Module
Description GRNADE models transmission through smoke screens are produced by multiple round salvos of tube-launched L8A1 and M76 self-screening grenades. Some aspects of atmospheric diffusion are treated, optical properties of screens are treated, and burst patterns of salvos can be varied. GRENADE specifically addresses inventory systems; however, the model can be adjusted slightly for developmental systems.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 619
Model or DB Title ILUMA—Natural Illumination Under Realistic Weather Conditions
Description The ILUMA model provides solar and lunar positions, as well as the natural illumination in lumens per square meter and watts per square meter under realistic atmospheric conditions. The model is a simple 2-stream radiative transfer model with three layers of atmosphere. The illumination is the total sum of the sun, moon, and background sky. The solar and lunar model is Berkove's algorithm for dates between January 1, 1977, and December 31, 1999.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Address-Line 2 2800 Powder Mill Road
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Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | 1 km | surface | 10 min |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 620
Model or DB Title KWIK-A Munition Expenditures Module
Description KWIK predicts the number of smoke munitions required to reduce the probability of target detection to a given level. KWIK also calculates the projectile impact separation, number of rounds, total expenditures, and rate of fire required to form and maintain a chemical smoke screen of desired length and duration.
Organization US Army Research Laboratory
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Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 621
Model or DB Title LASS—Large Area Screening Systems Application Module
Description LASS uses extensive preprogrammed look-up tables and novel scaling techniques to account for effects of single and multiple scattering to compute both the direct and diffuse components of radiation propagated along arbitrary slant paths and horizontal lines of sight. From this output other quantities required for target acquisition, such as contrast transmission and surface irradiance, can be calculated.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
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Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | 10 m | 10 m | 10 min |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 622
Model or DB Title LOWTRN-Atmospheric Transmittance/Radiance Module
Description LOWTRN calculates sensor-weighted atmospheric transmittance and/or thermal emission at moderate spectral resolution along specified paths through eight standard model atmospheres, a user-specified model atmosphere, or a set of meteorological conditions. This version of the module also calculates contrast. It is applicable to broad-band calculations only.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Radiative Features | 10 m | 10 m | 10 min |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 623
Model or DB Title LZTRAN—Laser Transmittance Module
Description LZTRAN calculates molecular absorption coefficients and transmittances for 97 specific laser frequencies ranging from the visible to the far infrared. Absorption coefficients and transmittances may be calculated for horizontal or slant paths between sea level and 5.0 km.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 624
Model or DB Title MPLUME—Missile Smoke Plume Obscuration Code
Description MPLUME predicts the location and spread of the plume from a Hellfire missile and the transmittance at visible, 1.06, 3–5, and 8–12 μm along any line of sight near the plume. Radiance at 8–12 μm is also calculated. This code predicts the performance of a TADS designator system under various conditions and can be used for planning field tests. The code is based on curve fits to result from a detailed plume calculation code and on an adaptation of a Gaussian plume model. MPLUME simulates TADS/HELLFIRE designation of battlefield targets from attack helicopters.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 625
Model or DB Title NBSCAT-Narrow Beam Multiple Scattering Module
Description NBSCAT is a multiple scattering propagation model applicable to narrow light beams transmitted through aerosol clouds. The module calculates the transmitted and backscattered irradiance profiles as functions of the field of view, and the on-axis transmitted power and lidar returns for specified receiver geometries. The algorithm is based on the radiative transfer model described by Bissonnette (1988) and validated against laboratory data as reported in Bissonnette, Smith et al. (1988).
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
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Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 626
Model or DB Title NMMW—Near Millimeter Wave Module
Description NMMW calculates for frequencies from 10 GHz to 1000 GHz the attenuation due to water vapor and oxygen absorption; cloud, fog, and ice fog bulk attenuation; rain and snow extinction; backscatter cross section for clouds, fog, ice fog, rain, and snow; and refractivity for oxygen and water vapor. Transmission over a specified path is also computed.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | 100 m | 100 m | 10 min |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 627
Model/DB Title NOVAE—Nonlinear Aerosol Vaporization and Breakdown Effects Module
Description NOVAE calculates both the aerosol breakdown and vaporization effects on high energy laser (HEL) propagation in the repetitive pulse mode, but only the aerosol vaporization effects in the continuous wave mode. Linear and nonlinear effects are included in the calculation of beam area and intensity.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | 100 m | 100 m | 10 min |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 628
Model or DB Title OVRCST-Contrast Transmission Module
Description OVRCST calculates beam transmittance, path radiance, and contrast transmittance along an arbitrary line of sight under an overcast sky. The program provides either thermal or single scattering calculations or path radiance, depending on the value of the atmospheric temperatures.
Organization US Army Research Laboratory
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Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 629
Model or DB Title PFNDAT-Aerosol Phase Function Database
Description PFNDAT contains phase functions, extinction and scattering coefficients, and the single-scattering albedo for 30 naturally-occurring aerosols, and 8 manmade aerosols for use with EOSAEL modules, or any routine that needs such data. The naturally-occurring aerosols consist of the maritime, urban, and rural aerosol-size distributions at eight relative humidities and two fog distributions (all consistent with those in LOWTRN), and rain and snow distributions. The manmade aerosols consist of three dust types, including a high-explosive distribution; white phosphorus at three relative humidities; hexachloroethane; and oil smoke. The database includes information for each aerosol at wavelengths ranging from 0.55 to 40.0 μm .
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 630
Model or DB Title RADAR-Millimeter Wave System Performance Module
Description RADAR calculates the system performance of various radars under different atmospheric conditions. In this way the modeler can see how different millimeter wave radars react to various atmospheric parameters.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | 100 m | 100 m | 10 min |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 631
Model or DB Title REFRAC—Optical Path Bending Code Module
Description The REFRAC module calculates the amount of curvature a ray of light experiences as it passes over a complex terrain surface, and thus calculates the refraction effects on lines of sight near ground level.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|-------------------------|-----------------------|-----------------------|
| Refractivity | 1 m | 1 m | 1 hr |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|--|
| Tracking No. | 632 |
| Model or DB Title | SCAFFIP—Scanning Fast Field Program Module |
| Description | SCAFFIP is based on the Fast Field Program (FFP) with the added ability to scan multiple azimuths when predicting the propagation conditions about the location of a sensor. SCAFFIP makes a prediction of the acoustic propagation conditions based on spherical spreading, molecular absorption, refraction, acoustically complex ground impedance, and diffraction over benign terrain. The FFP is a one-way solution to the acoustic wave equation, originally developed for underwater sound propagation predictions. It uses a propagation matrix formulation. By viewing each layer in the atmosphere as an optical device, a matrix for each layer can be constructed. Multiplying each matrix together results in a new matrix that represents how an acoustic signal will be affected as it propagates through the atmosphere. The next step is to take a Bessel Function Transform of the problem with respect to range. After the solution is calculated, an inverse transform is performed to arrive at the final solution. |
| Organization | US Army Research Laboratory |
| Point of Contact | Mr. David Marlin |
| Address-Line 1 | Battlefield Environment Directorate |
| Address-Line 2 | AMSRL-BE-S (ATTN: Dave Marlin) |
| Location | White Sands Missile Range, NM 88002-5501 |
| Phone Number | 505 678-5447 |
| E-mail Address | dmarlin@arl.mil |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 633
Model or DB Title TARGAC—Target Acquisition Model
Description TARGAC will evaluate the combined effects of target-background contrast, atmospheric transmission, and sensor performance on the range at which a target can be detected and/or recognized by an imaging device. It calculates range as a function of the probability of detection, recognition, and weather.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
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Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 634
Model or DB Title UVTRAN—An Ultraviolet Transmission and Lidar Simulation Module
Description UVTRAN is an atmospheric transmission and lidar return calculation module for visible and ultraviolet (UV) wavelengths. This EOSAEL module combines three codes: a transmission code suitable for use in the visible and UV regions, a backscatter code for Mie and fluorescence lidar return calculations, and a sky background radiance code. The result is a modular, menu-driven, user-friendly FORTRAN program.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 635
Model or DB Title XSCALE-Natural Extinction Module
Description XSCALE calculates the extinction and transmittance through naturally occurring aerosols (haze and fog), rain, and snow for horizontal paths, slant path extinction for haze and fog, and absorption and scattering coefficients for haze over horizontal paths. Computations are performed for both individual wavelengths and broadband averages (with optional filter response function) for arbitrary slant paths.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

| Atmospheric Data | Specific Capabilities and Fidelity | | |
|------------------|------------------------------------|----------------|----------------|
| | Horizontal Scale | Vertical Scale | Temporal Scale |
| Transmissivity | 1 m | 1 m | 1 s |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 636 |
| Model or DB Title | SCAPE-Scanning Parabolic Equation |
| Description | SCAPE is based on the Green's Function Parabolic Equation (PE), a split-step PE that incorporates complex ground impedance. SCAPE scans multiple azimuths to generate a quasi-three-dimensional footprint for an acoustic source or sensor. SCAPE uses spherical spreading, complex ground impedance, molecular absorption, and refraction due to wind and temperature profiles to predict transmission loss as a function of range, height, and azimuth. |
| Organization | US Army Research Laboratory |
| Point of Contact | Mr. David Marlin |
| Address-Line 1 | Battlefield Environment Directorate |
| Address-Line 2 | AMSRL-BE-S (ATTN: Dave Marlin) |
| Location | White Sands Missile Range, NM 88002-5501 |
| Phone Number | 505 678-5447 |
| E-mail Address | dmarlin@arl.mil |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 637 |
| Model or DB Title | NAPS—Noise Assessment and Prediction System |
| Description | NAPS utilizes a ray trace model coupled with terrain features and graphics to provide users with a visual display of noise levels on the surrounding community that may result from operations such as artillery firings and detonations. |
| Organization | US Army Research Laboratory |
| Point of Contact | Mr. David Marlin |
| Address—Line 1 | Battlefield Environment Directorate |
| Address—Line 2 | AMSRL-BE-S (ATTN: Dave Marlin) |
| Location | White Sands Missile Range, NM 88002-5501 |
| Phone Number | 505 678-5447 |
| E-mail Address | dmarlin@arl.mil |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 638 |
| Model or DB Title | Spherical—Ground impedance model based on equations by Attenborough |
| Description | Spherical uses the ground impedance model developed by Attenborough to predict how sound will propagate over a given surface. |
| Organization | US Army Research Laboratory |
| Point of Contact | Dr. John Noble |
| Address-Line 1 | Battlefield Environment Directorate |
| Address-Line 2 | AMSRL-BE-S (ATTN: John Noble) |
| Location | White Sands Missile Range, NM 88002-5501 |
| Phone Number | 505 678-3751 |
| E-mail Address | jnoble@arl.mil |

Army

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 639
Model or DB Title AGAUS-A Mie Code
Description AGAUS is a computer program to calculate the single scattering of electromagnetic radiation of a plane wave by a dielectric sphere or polydistributions of spheres using Mie Theory. AGAUS will calculate extinction, scattering, and backscattering coefficients, and (optionally) phase functions for polydisperse distributions of spherical aerosol particles. The phase functions are normalized so that their integral over all solid angles is unity. Humidification effects on aerosols can be included through the Gottfried Hanel aerosol growth formulas that calculate changes in radii and complex refractive indices. In general, the user will have to supply the real and imaginary parts of the complex refractive index of the particle, the radius of the particle in micrometers, and the incident wavelength of the particle size distributions. The output will be the Mie extinction, scattering and efficiency coefficients, and the backscattering coefficient. The scattering phase functions can be output as well, if the user so desires.
Organization US Army Research Laboratory
Point of Contact Dr. Alan Wetmore
Address-Line 1 ATTN: AMSRL-BE-SA (Dr. Wetmore)
Address-Line 2 2800 Powder Mill Road
Location Adelphi, MD 20783
Phone Number 301 394-1360
E-mail Address awetmore@arl.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | 1 m | 1 m | 1 s |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 701
Model or DB Title Seakeeping Evaluation Program (SEP) Wind and Wave Database
Description The Seakeeping Evaluation Program (SEP) Wind and Wave Database is a condensed version of the Spectral Ocean Wave Model (SOWM), hindcast wind, and wave climatic databases for the open ocean, North Atlantic, North Pacific, and Indian Oceans. Hydrodynamic characteristics that are altered by the wind and wave environment include seakeeping, maneuvering, powering, water and air wake, stack gas dispersion, and seaway loads on the ship structure.
Organization Naval Surface Warfare Center
Point of Contact Mrs. Kathryn McCreight
Address-Line 1 Commander, Carderock Division
Address-Line 2 Code 562, NSWC
Location Bethesda, MD 20084-5000
Phone Number 301 227-1242
E-mail Address kmccraig@oasys.dtic.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Humidity | SOWM | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 702
Model or DB Title Orbit Determination Program (ODP)
Description ODP software is used to compare operational orbits for Navy-operated spacecraft such as Transit. The ODP software is being upgraded to satisfy GEOSAT follow-on GFO mission requirements. Each version (old and new) of the ODP requires similar environmental input.
Organization Naval Space Command
Point of Contact CDR Tim Barock
Address N513
Location Dahlgren, VA 22448
Phone Number 703 663-7591

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 703
Model or DB Title Tactical Environmental Knowledge Base System (TEKBS)
Description TEKBS relates environmental sensitivities of weapon systems to environmental parameters that can be observed by space sensors. The software is not operational.
Organization Naval Space Command
Point of Contact CDR Tim Barock
Address N513
Location Dahlgren, VA 22448
Phone Number 703 663-7591

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 704
Model or DB Title Submarine Technological Environmental (STE) Database—Clouds
Description There are ~50 oceanographic, geological, meteorological (including clouds), and bathymetric databases.
Organization Johns Hopkins University
Point of Contact Ms. Christina Myles-Tochko
Address-Line 1 Applied Physics Laboratory
Address-Line 2 Johns Hopkins Road
Location Laurel, MD 20723-6099
Phone Number 301 953-6603

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Clouds | 200 km | 6 levels | 2 weeks |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 705
Model or DB Title Navy Operational Regional Atmospheric Prediction System (NORAPS)
Description The NORAPS is the only operational mesoscale forecast system used by the Navy at the Fleet Numerical Meteorological and Oceanography Center. The present version is globally relocatable and triple-nested (45, 15, and 5 km), but it is run operationally in a double-nested mode of 45 and 15 km for selected regions of the globe. NORAPS consists of two main modules: one prepares initial and boundary conditions, and the other conducts initialization and produces forecasts. The initial conditions are prepared on 16 standard pressure levels through multivariate optimum interpolation. The forecasts are computed from the primitive equations and physical parameterizations using staggered-C grids on sigma-p levels.
Organization Fleet Numerical Meteorology and Oceanography Center
Point of Contact Ms. Liana Zambresky
Address-Line 1 STOP 1
Address-Line 2 7 Grace Hopper Ave.
Location Monterey, CA 93943
Phone Number 408 656-4311
E-mail Address zambresk@fnoc.navy.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | 5–45 km | 36 levels | 1 hr |
| Humidity | 5–45 km | 36 levels | 1 hr |
| Mixing Ratio | 5–45 km | 36 levels | 1 hr |
| Precipitation | 5–45 km | 36 levels | 1 hr |
| Radiative Features | 5–45 km | 36 levels | 1 hr |
| Refractivity | 5–45 km | 36 levels | 1 hr |
| Sea Level Pressure | 5–45 km | 36 levels | 1 hr |
| Temperature | 5–45 km | 36 levels | 1 hr |
| Winds | 5–45 km | 36 levels | – 1 hr |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 706
Model or DB Title Navy Operational Global Atmospheric Prediction System (NOGAPS)
Description The NOGAPS is the primary numerical weather prediction (NWP) model supporting worldwide Navy operations. Over the last 15 yr NOGAPS has evolved to keep pace with advances in supercomputer hardware and software; today NOGAPS is one of five world-class NWP models. The current operational system, NOGAPS 3.3, is running on the Fleet Numerical Meteorology and Oceanography Center's Cray C90 twice daily, producing 2500 global atmospheric fields. The data sets support DoD operations, academia, and national laboratories.
Organization Fleet Numerical Meteorology and Oceanography Center
Point of Contact Dr. Randal Pauley
Address-Line 1 STOP 1
Address-Line 2 7 Grace Hopper Ave.
Location Monterey, CA 93943
Phone Number 408 656-4616
E-mail Address pauly@fnoc.navy.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------------|------------------|----------------|----------------|
| Clouds | 80 km | variable | 1 hr |
| Contrail Formation/Dispersion | 80 km | variable | 1 hr |
| Dew Point Temperature | 80 km | variable | 1 hr |
| Fog | 80 km | surface | 1 hr |
| Humidity | 80 km | variable | 1 hr |
| Precipitation | 80 km | surface | 1 hr |
| Sea Level Pressure | 80 km | surface | 1 hr |
| Temperature | 80 km | variable | 1 hr |
| Winds | 80 km | variable | 1 hr |
| Winds-Specific Features | 80 km | variable | 1 hr |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 707
Model or DB Title Aircraft Icing (AIRICE)
Description AIRICE provides an automated aircraft icing assessment from which naval forecasters can predict flight levels that may present hazardous icing conditions. The AIRICE function requires operator input and radiosonde data from the Geophysical Fleet Mission Programming Library (GFMPL) database to produce arrays of lapse rate, stability, icing probability, icing type, and icing intensity. This information is stored in the GFMPL database and is available for display by the forms manager or the graphics handler.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Clouds | N/A | N/A | N/A |
| Dew Point Temperature | N/A | N/A | N/A |
| Humidity | N/A | N/A | N/A |
| Temperature | N/A | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 708

Model or DB Title Anti-Air Warfare (AAW) Aircraft Stationing Aid

Description The AAW Program is designed to show the refractive distortion of normal propagation at a user-specified range for various combinations of radar transmitter and target/receiver altitudes. AAW's input consist of maximum radar/transmitter height, maximum target/receiver height, range of the display, and a refractivity data set from the Environmental Data Files (EDFs). The refractivity data set consists of a modified refractive index (M-unit) profile. The primary use of the AAW stationing aid is to assist in the optimum placement of the early warning aircraft radar or the electronic support measure (ESM) receiver. A series of outputs at different ranges can provide a good representation of a three-dimensional assessment of an electromagnet (EM) system's performance.

Organization Naval Oceanographic Office

Point of Contact Not Provided

Address-Line 1 Code: N54

Address-Line 2 Bay St. Louis

Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 709
Model or DB Title Meteorological Ballistic Winds and Densities Model (BALWIN)
Description The BALWIN program computes ballistic wind and density correction factors for US Navy and NATO gunfire support. The correction factors are produced in standard US Navy and NATO ballistic message formats. User-specified input includes the duration of the ballistic forecast and a specification of the radiosonde data set, which is retrieved from the Environmental Data Files.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 710
Model or DB Title Battle Group Vulnerability (BGV)
Description The BGV program provided estimates of vulnerability of the various platforms in a battle group to a specified electronic support measure system under varying environmental conditions. The vulnerability estimates, depicted as graphics, for an individual platform are expressed as the maximum intercept range of all active emitters on the platform. Intercept ranges for surface-to-air, air-to-air, and air-to-surface geometry can be calculated. The purpose is to minimize the group's vulnerability to counterdetection.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

| Atmospheric Data | Specific Capability | | |
|------------------|---------------------|----------------|----------------|
| | Horizontal Scale | Vertical Scale | Temporal Scale |
| Transmissivity | N/A | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 711
Model or DB Title Create Atmospheric Refractive Data Set (CARDS)
Description The CARDS function is used to create a refractivity data set for placement into the Refractivity Data File, which is used by various electromagnetic propagation programs. The refractivity data set contains a profile of the modified refractive index (M) with respect to height, the height of the evaporation duct, and surface wind speed.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | N/A | N/A | N/A |
| Winds | N/A | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 712
Model or DB Title Chaff Corridor Density (CCD) Model
Description CCD determines the number of chaff dispensers, the dispenser settings, and the dispensing aircraft's speed that will produce an effective chaff screen for a given friendly aircraft against a particular threat radar.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Chaff Dispersion | N/A | N/A | 1 s |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 713
Model or DB Title Chaff Trajectory Function (CHATRA) Model
Description CHATRA computes the optimal altitude of the chaff-dispensing corridor and the position for protecting a specified strike corridor, the fall time of the chaff, and the vertical and horizontal displacement of the mean chaff dipole from drop time throughout the fall.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis

Specific Capability and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Chaff Dispersion | N/A | N/A | 1 s |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 714

Model or DB Title The Oceanographic and Atmospheric Master Library (OAML) Navy Standard Radar Sea Clutter (CLUTTER) Model

Description CLUTTER provides a method for determining the average radar sea-clutter cross section as a function of wind speed (or sea state), wind direction relative to the antennae, atmospheric refractive conditions, radar antenna height, frequency, polarization, horizontal beam width, and compressed pulse length. The model provides an output of the average sea-clutter level (db) relative 1 m² target vs. target range (km). CLUTTER separates the antennae pattern effects and the environmental effects from the generalized form of the radar equation to provide a model of the average radar sea-clutter cross section.

Organization Naval Oceanographic Office

Point of Contact Not Provided

Address-Line 1 Code: N54

Address-Line 2 Bay St. Louis

Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 715
Model or DB Title Chaff Dispersion and Density (CHADIS) Model
Description CHADIS provides a three-dimensional view of the chaff cloud at a specific time after the chaff drop. Containment contours of the dispersed chaff cloud are computed for 90%, 50%, and 10% containment. Chaff dispersion is also represented as radar cross-section density contours.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Chaff Dispersion | 0.02 nmi | 100 m | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 719 |
| Model or DB Title | D-Values |
| Description | The D-Values Program accepts radiosonde data from files contained in the Tactical Environmental Support System database. Output consists of arrays of D-values and corresponding heights of standard pressure surfaces. |
| Organization | Naval Oceanographic Office |
| Point of Contact | Not Provided |
| Address-Line 1 | Code: N54 |
| Address-Line 2 | Bay St. Louis |
| Location | Stennis Space Center, MS 39522-5001 |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 720
Model or DB Title Warnings Plot
Description The Warnings Plot Program consists of three primary functions: the tropical cyclone plot, the high wind plot, and the high seas plot. The Warnings Plot provides the capability for comparing tropical cyclone forecasts and the display of areas of high wind and seas.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Winds | | | |
| Winds-Specific Features | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 721
Model or DB Title Wind Conversion Utility (TRUE WIND)
Description TRUE WIND provides the capability to convert the wind speed and direction as measured on a moving ship to the true wind, defined as the vector wind relative to a fixed point.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 722
Model or DB Title Tropical Cyclone Module
Description The Tropical Cyclone Program tracks tropical cyclone movements and conditions on a user-specified map, and it also provides the capability to enter storm data in the Environmental Data Files (EDF).
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001
Phone Number
E-mail Address

| Atmospheric Data | Specific Capabilities and Fidelity | | |
|-------------------------|------------------------------------|----------------|----------------|
| | Horizontal Scale | Vertical Scale | Temporal Scale |
| Winds | N/A | N/A | N/A |
| Winds-Specific Features | 15 nmi | N/A | 3 hr |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 723
Model or DB Title Tomahawk Land Attack Missile (TLAM) Wind and Temperature Correction
Description The TLAM Wind and Temperature Correction estimates the TLAM's time-of-flight (TOF) corrections, relative to planned TOF for calm wind and a standard day temperature type, for the effects of winds and temperatures along a given path through a spatially varying atmosphere. Gridded low-level winds and temperatures must be specified for the domain of interest.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 724
Model or DB Title Solar/Lunar Almanac Program (SLAP)
Description SLAP produces monthly or daily summaries of various sets of ephemeral data for the sun and moon and a light-level planning calendar for the evening sky.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| <u>Near Space Data</u> | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------------|------------------|----------------|----------------|
| Lunar Parameters | | | |
| Solar Parameters | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 725
Model or DB Title Sound Focus (SOCUS)
Description The SOCUS program provides a speed of sound profile with respect to height, a profile of maximum explosive noise (peak overpressure) with respect to the range of the explosive source, and the range from the bearing of caustics (sound focal points).
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------------|------------------|----------------|----------------|
| Nonnuclear Detonation Effects | 20 nmi | N/A | N/A |
| Refractivity | N/A | N/A | N/A |
| Temperature | N/A | N/A | N/A |
| Winds | N/A | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|--|
| Tracking No. | 726 |
| Model or DB Title | Sea-Surface Temperature Analysis and Composite (SSTAC) |
| Description | The SSTAC function determines sea-surface temperature (SST) patterns for selected areas of interest from satellite imagery collected from the National Oceanic and Atmospheric Administration and Defense Meteorological Satellite Program satellites. |
| Organization | Naval Oceanographic Office |
| Point of Contact | Not Provided |
| Address-Line 1 | Code: N54 |
| Address-Line 2 | Bay St. Louis |
| Location | Stennis Space Center, MS 39522-5001 |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 727
Model or DB Title Standard Electromagnetic Propagation (Standard EM Prop)
Description The Oceanographic and Atmospheric Master Library Navy Standard EM Prop model provided the user with a method of assessing EM propagation from 100 MHz to 20 GHz in the marine environment for a variety of atmospheric conditions. The output is a pattern propagation factor (dB), a parameter found in most radar range detection equations.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | | | |
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 728
Model or DB Title Surface-Search Radar (SRR) Range Table
Description The SRR Range Table program determines detection ranges of predefined U.S. and Soviet surface targets for SPS-10/SPS-65 and SPS-55 surface-search radars. The output refractivity data set is composed of a profile of modified refractive indices (m-unit) with respect to height, the height of the evaporation duct, and the surface wind speed.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 729
Model or DB Title Tomahawk Anti-Ship Missile (TASM) Effective Wind Model
Description The TASM Effective Wind Model computes an effective or bogus wind to compensate for the flight (from launch point to search point) of the TASM through a spatially varying wind field, rather than the average or launch-point wind usually used.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 730
Model or DB Title Tomahawk Environmental Calculation Aid (TECA)
Description TECA is designed to automate complex calculations of weighted-mean averages of wind speed and direction and the temperature of the overland flight path of the Tomahawk strike mission.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Precipitation | | | |
| Temperature | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 731
Model or DB Title Temperature Utility (TEMP UTL)
Description TEMP UTL provides temperatures and humidity calculations, including comfort temperatures (wind chill and heat stress).
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | | | |
| Humidity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 732
Model or DB Title Tactical/Environmental Ship Routing (TESR)
Description TESR is a program that computes optimal ship routes and evaluates the costs associated with routing surface ships. It considers tactical parameters such as acoustic and electromagnetic propagation conditions; environmental conditions including ship heave, pitch, and roll; and fuel efficiency.
Organization Naval Research Laboratory
Point of Contact Mr. Sam Brand
Address-Line 1 Marine Meteorology Research Division
Address-Line 2 7 Grace Hopper Drive
Location Monterey, CA 93943-5006
Phone Number 408 656-4748

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-------------------------|------------------|----------------|----------------|
| Winds | 250 km | N/A | N/A |
| Winds-Specific Features | 250 km | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 733
Model or DB Title Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS)
Description COAMPS is a three-dimensional triple-nested nonhydrostatic atmospheric model and a hydrostatic ocean model that can be run either separately (stand-alone) or integrated (coupled) for high-resolution (<10 km) predictions of the atmosphere and/or ocean. The models can be integrated so that the surface fluxes of heat, momentum, and moisture are exchanged across the air-sea interface at every time step. COAMPS will become operational at the Fleet Numerical Meteorological and Oceanographic Center in mid-1996 in a triple-nested mode (81, 27, and 9 km).
Organization Naval Research Laboratory
Point of Contact Dr. Richard Hodur
Address-Line 1 Marine Meteorology Research Division
Address-Line 2 7 Grace Hopper Drive
Location Monterey, CA 93943-5502
Phone Number 408 656-4788
E-mail Address hodur@nrlmry.navy.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Clouds | 9000 m | 10–1000 m | 30 s |
| Dew Point Temperature | 9000 m | 10–1000 m | 30 s |
| Fog | 9000 m | 10–1000 m | 30 s |
| Mixing Ratio | 9000 m | 10–1000 m | 30 s |
| Precipitation | 9000 m | 10–1000 m | 30 s |
| Radiative Features | 9000 m | 10–1000 m | 30 s |
| Refractivity | 9000 m | 10–1000 m | 30 s |
| Sea Level Pressure | 9000 m | 10–1000 m | 30 s |
| Temperature | 9000 m | 10–1000 m | 30 s |
| Winds | 9000 m | 10–1000 m | – 30 s |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 734
Model or DB Title Direct Method Evaporation Duct (DMED) Model
Description The DMED model is used to estimate the temperature, humidity, and refractivity profiles at very-high resolution from the sea surface to about 100 m. Output is at a point (a "stick" representation); input is shipboard measurements of air and sea-surface temperature, humidity, and wind speed.
Organization Naval Research Laboratory
Point of Contact Mr. John Cook
Address-Line 1 Marine Meteorology Research Division
Address-Line 2 7 Grace Hopper Drive
Location Monterey, CA 93943-5502
Phone Number 408 656-4785
E-mail Address cook@nrlmry.navy.mil

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | 0.1 m | sfc–100 m | |
| Humidity | 0.1 m | sfc–100 m | |
| Refractivity | 0.1 m | sfc–100 m | |
| Sea Level Pressure | | | |
| Static Pressure | | | |
| Temperature | 0.1 m | sfc–100 m | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 735
Model or DB Title Rowland-Rotter Evaporation Duct Model (RRM)
Description The Rowland-Rotter Evaporation Duct Model provides an estimate of the evaporation duct refractivity profile based on a few shipboard measurements.
Organization Johns Hopkins University
Point of Contact Mr. John Rowland
Address-Line 1 Applied Physics Laboratory
Address-Line 2 Johns Hopkins Road
Location Laurel MD 20723
Phone Number 301 953-6000

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Humidity | N/A | 0.1 | N/A |
| Refractivity | N/A | 0.1 | N/A |
| Sea Level Pressure | N/A | 0.1 | N/A |
| Static Pressure | N/A | | |
| Temperature | N/A | 0.1 | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 736
Model or DB Title Tropospheric Electromagnetic Parabolic Equation Routine (TEMPER)
Description TEMPER describes the propagation of electromagnetic energy in the lower troposphere under specified refractive conditions.
Organization Johns Hopkins University
Point of Contact Mr. G. Dockery
Address-Line 1 Applied Physics Laboratory
Address-Line 2 Johns Hopkins Road
Location Laurel, MD 20723
Phone Number 301 953-5461

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 737
Model or DB Title Electromagnetic Propagation Conditions Summary (PCS)
Description The Electromagnetic Propagation Conditions Summary graphically depicts refractive conditions of electromagnetic (EM) energy in the atmosphere. Input consists of a refractivity data set composed of an M-unit (modified refractivity) profile with respect to height, the height of the evaporation duct, and the surface wind speed. The output provides the capability to determine the salient characteristics of EM propagation under given atmospheric conditions, assisting in decisions on which EM systems require special consideration for their effective tactical employment.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 738
Model or DB Title Electronic Countermeasures (ECM) Effectiveness Display
Description The ECM Effectiveness Display program provides a measure of airborne jammer effectiveness against surface-based (victim) radars. Signal strength relative to free space is calculated and displayed with respect to height for five equally-spaced discrete ranges. Inputs consist of the victim radar and jammer of interest, and a refractivity data set from the Meteorological/Electromagnetic (MET/EM) Environmental Data File.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
|------------------|------------------|----------------|----------------|

Refractivity

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 739
Model or DB Title Evaporation Duct Height (EDH) Model
Description The Evaporation Duct Height Model computes evaporation duct height when given the required input: wind speed, air temperature, relative humidity, and sea-surface temperature.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 740
Model or DB Title Electromagnetic (EM) Coverage Diagram (COVER)
Description COVER provides a display of radar detection, communication, or sonobuoy coverage in the vertical plane. Input consists of the radar or communication system of interest and its height, the system if airborne, and the refractivity data set from the Refractivity Data File (RDF). COVER provides the capability to determine how a given EM system will perform under given atmospheric conditions in detecting or communicating with a given target or receiver.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | N/A | 1 m | N/A |
| Transmissivity | N/A | N/A | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 741
Model or DB Title Electromagnetic (EM) Path-loss vs. Range (LOSS)
Description The LOSS program provides a display of one-way path loss vs. range or path loss for electronic support measures intercept vs. range. Input consists of data from the RDF, heights of EM transmitter and target or receiver, and data on the user-specified EM system. LOSS provides the capability to assess the performance of the given system under given atmospheric conditions.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Refractivity | | | |
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 742
Model or DB Title Electronic Support Measures (ESM) Range Tables
Description The ESM Range Tables program calculates the maximum intercept ranges of U.S. and Soviet surface emitters by user-specified ESM receivers. Input consists of receiver and emitter characteristics from the database file and a refractivity data set from the Environmental Data Files. The refractivity data set consists of a modified refractive index (M-unit) profile with respect to height, the height of the evaporation duct, and the surface wind speed.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
|------------------|------------------|----------------|----------------|

| | | | |
|----------------|--|--|--|
| Transmissivity | | | |
|----------------|--|--|--|

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 743
Model or DB Title Forward-Looking Infrared (FLIR) System Prediction
Description The FLIR System Prediction program determines the detection, categorization, and identification ranges of airborne sensors against surface targets. Ranges are given as a function of aircraft altitude for a 50% probability of detection, categorization, and identification of the target. The input atmospheric data (height, pressure, temperature, and dewpoint) are provided by the Atmospheric Environmental File (AEF).
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Humidity | | | |
| Visibility | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 744
Model or DB Title Historical Electromagnetic Propagation Conditions (HEPC)
Description The HEPC program generates a climatological electromagnetic propagation condition summary for a user-specified location and month. A historical refractivity data file must be retrieved from the Permanent Data Base (PDB).
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 745
Model or DB Title High Frequency Communications (HF COMMS)
Description The HF COMMS program simulates the tactical use of the HF band (2–32 MHz). HF COMMS determines the potential for a hostile force to intercept a transmission, locate a transmitter, or jam a receiver.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 746 |
| Model or DB Title | Historical Wind Speed (HWS) |
| Description | The HWS data set describes ocean surface wind-speed statistics by month on a geographic grid. The statistics include the 20th, 50th, and 80th percentile, and mean wind speeds and direction for each 45° compass sector. |
| Organization | Naval Oceanographic Office |
| Point of Contact | Not Provided |
| Address-Line 1 | Code: N54 |
| Address-Line 2 | Bay St. Louis |
| Location | Stennis Space Center, MS 39522-5001 |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 747
Model or DB Title HF Lowest Usable Frequency (HF LUF)
Description The HF LUF model allows simplified HF LUF predictions to be performed in near-real time for user-specified position of receivers and transmitters, the antennae type, date and time, and solar x-ray flux.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 748
Model or DB Title Laser Range Prediction (LRP)
Description The LRP model displays range information for exposure to low-level laser radiation, both by height vs. range and by difference between day and night. It also displays range vs. time of exposure for different levels of exposure to laser radiation.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | | | |
| Humidity | | | |
| Sea Level Pressure | | | |
| Temperature | | | |
| Visibility | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 749
Model or DB Title HF Maximum Usable Frequency (HF MUF) Program
Description The HF MUF program is a semi-empirical model that performs simplified HF MUF near-real-time predictions, given input of user-specified receiver-transmitter positions and solar sunspot number.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 750
Model or DB Title Multivariate Optimum Interpolation (MVOI)
Description MVOI is a geostrophically constrained analysis of geopotential heights and winds.
Input is from various data sources.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Winds | 1000 m | 200 m | N/A |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 751
Model or DB Title Ooyama Analysis
Description The Ooyama Analysis interpolates observations to a specified grid using a weighting based on the distance of these observations from the specified grid points.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | | | |
| Sea Level Pressure | | | |
| Temperature | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 752
Model DB Title Pressure Altitude/Density Altitude (PADA)
Description The PADA Program provides ranges of pressure and density altitudes, altimeter settings, and sea-level pressures. Input consists of air and dewpoint temperatures, station elevation, 12-hr mean station temperature, and upper-lower station pressure.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Sea Level Pressure | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 753
Model or DB Title Pilot Balloon (PIBAL)
Description The PIBAL Program computes a vertical profile of wind speed and direction based upon the observations provided by a pilot balloon, whose input consist of angles of elevation and azimuth to the balloon at 1-min intervals.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | N/A | N/A | N/A |
| Humidity | N/A | N/A | N/A |
| Sea Level Pressure | N/A | N/A | N/A |
| Temperature | N/A | N/A | N/A |
| Winds | N/A | 300 m | 60 s |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 754
Model or DB Title Platform Vulnerability
Description Platform vulnerability provides estimates of the vulnerability (maximum intercept range) of the various emitters on a platform to a specified electronic support measure system under varying environmental conditions.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Transmissivity | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 755
Model or DB Title Radiological Fallout (RADFO)
Description The RADFO model forecasts a pattern of an accumulated dose of radioactivity caused by a specified type of nuclear detonation dispersed by upper level winds. Input includes information on the detonation and an upper wind profile retrieved from Environmental Data Files.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--------------------|------------------|----------------|----------------|
| Nuclear Weapons | | | |
| Detonation Effects | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 756
Model or DB Title Radar Free-Space Detection Range (RFSDR)
Description The RFSDR model calculates the maximum free-space detection range of a pulse-radar system against a target of specific size. The Free-Space Intercept Range Program calculates the maximum free-space range of an electronic support measure (ESM) receiver.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 757
Model or DB Title Radiosonde Initial Analysis (RIA)
Description The RIA Program analyzes and displays vertical atmospheric data and provides input to various meteorological and electromagnetic propagation application programs.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|-----------------------|------------------|----------------|----------------|
| Dew Point Temperature | | | |
| Humidity | | | |
| Sea Level Pressure | | | |
| Temperature | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

| | |
|-------------------|---|
| Tracking No. | 758 |
| Model or DB Title | Radio Physical Optics (RPO) |
| Description | The RPO Program calculates range-dependent electromagnetic system propagation loss within a heterogeneous atmospheric medium where the index of refraction is allowed to vary both vertically and horizontally. |
| Organization | Naval Oceanographic Office |
| Point of Contact | Not Provided |
| Address-Line 1 | Code: N54 |
| Address-Line 2 | Bay St. Louis |
| Location | Stennis Space Center, MS 39522-5001 |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 759
Model or DB Title Ship Ice Accretion (SHIP ICE)
Description The SHIP ICE Program provides estimates of ship ice accretion rates vs. time for given wind speed and air and sea-surface temperature at various forecast times.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capabilities

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|------------------|------------------|----------------|----------------|
| Temperature | | | |
| Winds | | | |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 760
Model or DB Title Chemical/Biological Agent Vapor, Liquid, and Solid (VLSTRACK) Model
Description The VLSTRACK model provides approximate downrange hazard predictions for many currently known or suspected chemical and biological agents and for a wide variety of munitions capable of disseminating these agents. The model can be used for operational hazard assessment or for research and development studies. VLSTRACK either uses meteorological input from the multivariate optimum interpolation and/or the Navy Operational Regional Atmospheric Prediction System, or can stand alone by using a uniform field.
Organization Naval Oceanographic Office
Point of Contact Not Provided
Address-Line 1 Code: N54
Address-Line 2 Bay St. Louis
Location Stennis Space Center, MS 39522-5001

Specific Capability and Fidelity

| Atmospheric Data | Horizontal Scale | Vertical Scale | Temporal Scale |
|--|------------------|----------------|----------------|
| <hr/> | | | |
| Dispersion of Agents, Flares, and Plume | 0.78125 m | 2 m | 300 s |

Navy

E²DIS Survey of Environmental Models and Databases (DBs)

Tracking No. 761

Model or DB Title Seasonal Cloud Amount and Cloud-Free Line-of-Sight (CFLOS) Data for Oceanic Areas

Description More than 30 reports were prepared in the early 1980s as part of the Oceanic Cloud Analysis for Military Operations (OCAMO) project by the Geophysics Division of the Pacific Missile Test Center. The objective of this project is to relate cloud amount to the utilization of weapons systems and sensors over the seas. The reports provide sets of cloud cover and CFLOS statistics for specific oceanic areas of interest in the Northern Hemisphere. Statistics are presented for the midseason months of January, April, July, and October on frequencies of five maximum cloud amounts at and below eight specified altitudes, and probabilities of CFLOS occurrences at five elevation angles between the surface and seven specified altitudes. These documents were prepared by Mr. Robert de Violini, Dr. Alexis Shlanta, and Mr. Clarence B. Elam, Jr.

Organization Geophysics Division, Pacific Missile Test Center

Point of Contact The Commander

Address-Line 1 (Code 0334-1)

Address-Line 2 Pacific Missile Test Center

Location Point Magu, CA 93042

APPENDIX G

ENVIRONMENTAL MODELS AND DATABASES

IN THE

SURVEY DATABASE

GROUPED ACCORDING TO MAJOR COMPONENTS

OF

MILITARY SIMULATIONS

28 Environmental Databases

| <u>Service or Agency</u> | <u>Tracking No.</u> | <u>Title</u> |
|--------------------------|---------------------|---|
| Air Force: | 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| | 531 | DATSAV2 Surface |
| | 532 | Summary of the Day |
| | 533 | DATSAV2 Satellite |
| | 534 | DATSAV2 Rocketsonde |
| | 535 | DATSAV2 Upper Air |
| | 536 | DATSAV2 Aircraft |
| | 537 | PIBAL |
| | 538 | Winds Aloft |
| | 539 | Radiosonde |
| | 540 | Lightning |
| | 541 | RTNEPH 6-Month |
| | 542 | RTNEPH Histogram |
| | 543 | RTNEPH-LMHT/A Hemispheric |
| | 544 | 3DNEPH 6-Monthly |
| | 545 | 3DNEPH-LMHT/A Hemispheric |
| | 546 | High Resolution Analysis |
| | 551 | Snow Depth Climatology |
| | 560 | Military Standard 210C |
| Army: | 601 | PEGASUS |
| | 613 | CLIMAT-The Climatology Model |
| | 629 | PFNDAT-Aerosol Phase Function Database |
| Navy: | 701 | Seakeeping Evaluation Program (SEP) Wind and Wave Database |
| | 704 | Submarine Technological Environmental (STE) Database—Clouds |
| | 711 | Create Atmospheric Refractive Data Set (CARDS) |
| | 746 | Historical Wind Speed (HWS) |
| | 747 | HF Lowest Usable Frequency (HFLUF) |
| | 761 | Seasonal Cloud Amount and Cloud-Free Line-of-Sight Data for Oceanic Areas |

57 Environmental Effects Models

| <u>Service or Agency</u> | <u>Tracking No.</u> | <u>Title</u> |
|--------------------------|---------------------|---|
| Air Force: | 501 | Electro-Optical Tactical Decision Aid (EOTDA) |
| | 502 | Night Vision Goggle Operations (NOWS) |
| | 503 | Air Combat Targeting/Electro-Optical Simulation (ACT/EOS) |
| | 515 | Combined Radiation and Release Effects Satellite Space Radiation (CRRESRAD) Model |
| Army: | 610 | Smart Weapons Operability Enhancement (SWOE) |
| | 612 | BITS—Broadband Integrated Transmittances |
| | 614 | COMBIC—Combined Obscuration Model for Battlefield Induced Contaminants |
| | 615 | COPTER—Obscuration Due to Helicopter Lofted Snow and Dust Module |
| | 617 | FITTE—The Fire Induced Transmission and Turbulence Effects Module |
| | 618 | GRNADE—Self-Screening Applications Module |
| | 620 | KWIK—A Munition Expenditures Module |
| | 621 | LASS—Large Area Screening Systems Application Module |
| | 622 | LOWTRN—Atmospheric Transmittance/Radiance Module |
| | 623 | LZTRAN—Laser Transmittance Module |
| | 624 | MPLUME—Missile Smoke Plume Obscuration Code |
| | 625 | NBSCAT—Narrow Beam Multiple Scattering Module |
| | 626 | NMMW—Near Millimeter Wave Module |
| | 627 | NOVAE—Nonlinear Aerosol Vaporization and Breakdown Effects Module |
| | 628 | OVRCST—Contrast Transmission Module |
| | 630 | RADAR—Millimeter Wave System Performance Module |
| | 631 | REFRAC—Optical Path Bending Code Module |
| | 632 | SCAPPIF—Scanning Fast Field Program Module |
| | 633 | TARGAC—Target Acquisition Model |
| | 634 | UVTRAN—An Ultraviolet Transmission and Lidar Simulation Module |
| | 636 | SCAPE—Scanning Parabolic Equation |
| | 637 | NAPS—Noise Assessment and Prediction System |
| | 638 | Spherical—Ground impedance model based on equations by Attenborough |
| | 639 | AGAUS—A Mie Code |
| Navy: | 702 | Orbit Determination Program (ODP) |
| | 703 | Tactical Environmental Knowledge Base System (TEKBS) |
| | 708 | Anti-Air Warfare Aircraft Stationing Aid (AAW) |
| | 710 | Battle Group Vulnerability (BGV) |
| | 712 | Chaff Corridor Density (CCD) Model |
| | 713 | Chaff Trajectory Function (CHATRA) Model |
| | 714 | The OAML Navy Standard Radar Sea Clutter (CLUTTER) Model |
| | 715 | Chaff Dispersion and Density (CHADIS) Model |

57 Environmental Effects Models (Continued)

| <u>Service or Agency</u> | <u>Tracking No.</u> | <u>Title</u> |
|--------------------------|---------------------|--|
| Navy: | 725 | Sound Focus (SOCUS) |
| (continued) | 727 | Standard Electromagnetic Propagation (Standard EM Prop) |
| | 728 | Surface-Search Radar (SRR) Range Table |
| | 729 | Tomahawk Anti-Ship Missile (TASM) Effective Wind Model |
| | 732 | Tactical/Environmental Ship Routing (TESR) |
| | 734 | Direct Method Evaporation Duct (DMED) Model |
| | 736 | Tropospheric Electromagnetic Parabolic Equation Routine (TEMPER) |
| | 737 | Electromagnetic Propagation Conditions Summary (PCS) |
| | 738 | Electronic Countermeasures (ECM) Effectiveness Display |
| | 740 | Electromagnetic (EM) Coverage Diagram (COVER) |
| | 741 | Electromagnetic (EM) Path-loss vs. Range (LOSS) |
| | 742 | Electronic Support Measures (ESM) Range Tables |
| | 743 | Forward-Looking Infrared (FLIR) System Prediction |
| | 744 | Historical Electromagnetic Propagation Conditions (HEPC) |
| | 745 | High Frequency Communications (HF COMMS) |
| | 748 | Laser Range Prediction (LRP) |
| | 749 | HF Maximum Usable Frequency (HFMUF) Program |
| | 754 | Platform Vulnerability |
| | 755 | Radiological Fallout (RADFO) |
| | 756 | Radar Free-Space Detection Range (RFSDR) |
| | 758 | Radio Physical Optics (RPO) |
| | 760 | Chemical/Biological Agent Vapor, Liquid, and Solid (VLSTRACK) Model |

67 Environmental Models

| <u>Service or Agency</u> | <u>Tracking No.</u> | <u>Title</u> |
|--------------------------|---------------------|--|
| Air Force: | 505 | FASCOD3 (to be FASCODE4 or FASE) |
| | 506 | MODTRAN3 (replacing LOWTRAN7) |
| | 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| | 508 | Strategic High Altitude Radiance Code (SHARC) |
| | 509 | SHARE and MODTRAN Merged (SAMM) |
| | 510 | Synthetic 3-D Atmospheric Temperature: A Model for Known Geophysical Power Spectra Using a Hybrid Autoregression and Fourier Technique |
| | 511 | Cloud Scene Simulation Model (CSSM) |
| | 512 | Atmospheric Radiance Code/Auroral Atmospheric Radiance Code (ARC/AARC) |
| | 513 | PLEXUS |
| | 514 | Combined Radiation and Release Effects Satellite Proton Flux (CRRESPRO) Model |
| | 516 | Improved Aurora Precipitation Model (IAPM) |
| | 517 | Interplanetary Shock Propagation Model |
| | 518 | Magnetosphere Specification and Forecast Model |
| | 519 | Solar Wind Transport Model |
| | 520 | Solar Flare Forecast Model |
| | 521 | AGRMET |
| | 522 | Atmospheric Slant Path Analysis Model (ASPAM) |
| | 523 | 5-Layer Cloud Model |
| | 524 | High Resolution Cloud Prognosis (HRCP) |
| | 525 | High Resolution Analysis System/Global Spectral Model (HIRAS/GSM) |
| | 526 | Real-Time Nephanalysis (RTNEPH) |
| | 527 | Relocatable Window Model (RWM) |
| | 528 | Snow Depth (SNODEP) |
| | 529 | Surface Temperature Model (SFCTMP) |
| | 530 | New Tropical (TRONEW) Cloud Model |
| | 547 | Eighth-Mesh Surface Temperature Analysis |
| | 548 | Boundary Layer Window Analysis |
| | 549 | Upper-Air Window Analysis |
| | 550 | Vertical Velocity Analysis |
| | 554 | Jacchia Atmospheric Density (JAD) Model, 1970 |
| | 555 | Space Environmental Specification and Forecast System (SESFS) |
| | 556 | Celestial Background Scene Descriptor (CBSD) |
| | 557 | AFGL-TR-89-0012, Effects of Rain Attenuation on Satellite EHF Communications in the United States |
| | 558 | A Climatological Model for 1-Minute Precipitation Rates |
| | 559 | Drop-Size Distribution Associated with Intense Rainfall |

67 Environmental Models (Continued)

| <u>Service or Agency</u> | <u>Tracking No.</u> | <u>Title</u> |
|---------------------------|---------------------|--|
| Air Force: (continued) | 561 | Universal Methods for Estimating Probabilities of Cloud-Free Lines-of-Sight Through the Atmosphere |
| | 562 | Estimating Probabilities of Cloud-Free Fields-of-View Through the Atmosphere |
| | 563 | Clear and Cloud-Free Lines-of-Sight from Aircraft |
| | 564 | Atlas of Cloud-Free Line-of-Sight Probabilities, Parts 1-5: Northern Hemisphere |
| | 566 | Probability-of-Cloud Statistics (P Cloud S) |
| Army: | 609 | Synthetic Environments |
| | 616 | FASCAT-Atmospheric Illumination Module |
| | 619 | ILUMA-Natural Illumination Under Realistic Weather Conditions |

59 Environmental Models

| <u>Service or Agency</u> | <u>Tracking No.</u> | <u>Title</u> |
|--------------------------|---------------------|---|
| Navy: | 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| | 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| | 707 | Aircraft Icing (AIRICE) |
| | 709 | Meteorological Ballistic Winds and Densities Model (BALWIN) |
| | 719 | D-Values |
| | 720 | Warnings Plot |
| | 721 | Wind Conversion Utility (TRUE WIND) |
| | 722 | Tropical Cyclone Module |
| | 723 | Tomahawk Land Attack Missile (TLAM) Wind and Temperature Correction |
| | 724 | Solar/Lunar Almanac Program (SLAP) |
| | 726 | Sea-Surface Temperature Analysis and Composite (SSTAC) |
| | 730 | Tomahawk Environmental Calculation Aid (TECA) |
| | 731 | Temperature Utility (TEMP UTL) |
| | 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| | 735 | Rowland-Rotter Evaporation Duct Model (RRM) |
| | 739 | Evaporation Duct Height (EDH) Model |
| | 750 | Multivariate Optimum Interpolation (MVOI) |
| | 751 | Ooyama Analysis |
| | 752 | Pressure Altitude/Density Altitude (PADA) |
| | 753 | Pilot Balloon (PIBAL) |
| | 757 | Radiosonde Initial Analysis (RIA) |
| | 759 | Ship Ice Accretion (SHIP ICE) |

APPENDIX H

INDEX OF ATMOSPHERIC DATA TYPES

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-------------------------|---|
| AEROSOLS | |
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 511 | Cloud Scene Simulation Model (CSSM) |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 531 | DATSAV2 Surface |
| 532 | Summary of the Day |
| 541 | RTNEPH 6-Month |
| 544 | 3DNEPH 6-Monthly |
| 545 | 3DNEPH-LMHT/A Hemispheric |
| ATMOSPHERIC ELECTRICITY | |
| 531 | DATSAV2 Surface |
| 536 | DATSAV2 Aircraft |
| 540 | Lightning |
| CHAFF DISPERSION | |
| 712 | Chaff Corridor Density (CCD) Model |
| 713 | Chaff Trajectory Function (CHATRA) Model |
| 715 | Chaff Dispersion and Density (CHADIS) Model |
| CLOUDS | |
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 511 | Cloud Scene Simulation Model (CSSM) |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 523 | 5-Layer Cloud Model |
| 524 | High Resolution Cloud Prognosis |
| 526 | Real-Time Nephanalysis (RTNEPH) |
| 530 | New Tropical (TRONEW) Cloud Model |
| 531 | DATSAV2 Surface |
| 535 | DATSAV2 Upper Air |
| 536 | DATSAV2 Aircraft |
| 541 | RTNEPH 6-Month |
| 542 | RTNEPH Histogram |
| 543 | RTNEPH-LMHT/A Hemispheric |
| 544 | 3DNEPH 6-Monthly |
| 545 | 3DNEPH-LMHT/A Hemispheric |
| 546 | High Resolution Analysis |

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-----------------|-----------------------------------|
|-----------------|-----------------------------------|

CLOUDS (Continued)

- | | |
|-----|--|
| 613 | CLIMAT-The Climatology Model |
| 704 | Submarine Technological Environmental (STE) Database—Clouds |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 707 | Aircraft Icing (AIRICE) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |

COMBAT-GENERATED DUST

- | | |
|-----|--|
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 614 | COMBIC—Combined Obscuration Model for Battlefield Induced Contaminants |

CONTRAIL FORMATION AND DISPERSION

- | | |
|-----|--|
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 536 | DATSAV2 Aircraft |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |

DEW POINT TEMPERATURE

- | | |
|-----|---|
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 531 | DATSAV2 Surface |
| 535 | DATSAV2 Upper Air |
| 536 | DATSAV2 Aircraft |
| 546 | High Resolution Analysis |
| 549 | Upper-Air Window Analysis |
| 613 | CLIMAT-The Climatology Model |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 707 | Aircraft Icing (AIRICE) |
| 731 | Temperature Utility (TEMP UTL) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 748 | Laser Range Prediction (LRP) |
| 751 | Ooyama Analysis |
| 753 | Pilot Balloon (PIBAL) |
| 757 | Radiosonde Initial Analysis (RIA) |

DISPERSION OF AGENTS, FLARES AND PLUMES

- | | |
|-----|---|
| 760 | Chemical/Biological Agent Vapor, Liquid, and Solid (VLSTRACK) Model |
|-----|---|

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-----------------|---|
| FOG | |
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 531 | DATSAV2 Surface |
| 532 | Summary of the Day |
| 541 | RTNEPH 6-Month |
| 544 | 3DNEPH 6-Monthly |
| 545 | 3DNEPH-LMHT/A Hemispheric |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| HUMIDITY | |
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 521 | AGRMET |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 525 | High Resolution Analysis System/Global Spectral Model (HIRAS/GSM) |
| 527 | Relocatable Window Model (RWM) |
| 539 | Radiosonde |
| 546 | High Resolution Analysis |
| 548 | Boundary Layer Window Analysis |
| 613 | CLIMAT-The Climatology Model |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 707 | Aircraft Icing (AIRICE) |
| 731 | Temperature Utility (TEMP UTL) |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 735 | Rowland-Rotter Evaporation Duct Model (RRM) |
| 743 | Forward-Looking Infrared (FLIR) System Prediction |
| 748 | Laser Range Prediction (LRP) |
| 753 | Pilot Balloon (PIBAL) |
| 757 | Radiosonde Initial Analysis (RIA) |
| MIXING RATIO | |
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-----------------|--|
| | NON-NUCLEAR MUNITIONS DETONATION EFFECTS |

725 Sound Focus (SOCUS)

NUCLEAR WEAPONS DETONATION EFFECTS

512 Atmospheric Radiance Code/Auroral Atmospheric Radiance Code (ARC/AARC)
755 Radiological Fallout (RADFO)

PRECIPITATION

504 Night Vision Goggle Operations (NOWS) Weather Software Database
505 FASCOD3 (to be FASCODE4 or FASE)
507 Moderate Spectral Atmospheric Radiance and Transmittance (MOSART)
511 Cloud Scene Simulation Model (CSSM)
521 AGRMET
527 Relocatable Window Model (RWM)
531 DATSAV2 Surface
532 Summary of the Day
536 DATSAV2 Aircraft
541 RTNEPH 6-Month
544 3DNEPH 6-Monthly
545 3DNEPH-LMHT/A Hemispheric
613 CLIMAT-The Climatology Model
705 Navy Operational Regional Atmospheric Prediction System (NORAPS)
706 Navy Operational Global Atmospheric Prediction System (NOGAPS)
730 Tomahawk Environmental Calculation Aid (TECA)
733 Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS)

RADIATIVE FEATURES

501 Electro-Optical Tactical Decision Aid (EOTDA)
504 Night Vision Goggle Operations (NOWS) Weather Software Database
505 FASCOD3 (to be FASCODE4 or FASE)
507 Moderate Spectral Atmospheric Radiance and Transmittance (MOSART)
508 Strategic High Altitude Radiance Code (SHARE)
509 SHARE and MODTRAN Merged (SAMM)
513 PLEXUS
521 AGRMET
531 DATSAV2 Surface
551 Snow Depth Climatology
555 Space Environmental Specification and Forecast System (SESFS)
616 FASCAT-Atmospheric Illumination Module
617 FITTE-The Fire Induced Transmission and Turbulence Effects Module
619 ILUMA-Natural Illumination Under Realistic Weather Conditions
621 LASS-Large Area Screening Systems Application Module
622 LOWTRN-Atmospheric Transmittance/Radiance Module

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|--------------------------------|---|
| RADIATIVE FEATURES (Continued) | |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| REFRACTIVITY | |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 513 | PLEXUS |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| 626 | NMMW-Near Millimeter Wave Module |
| 627 | NOVAE-Nonlinear Aerosol Vaporization and Breakdown Effects Module. |
| 630 | RADAR-Millimeter Wave System Performance Module |
| 631 | REFRAC-Optical Path Bending Code Module |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 708 | Anti-Air Warfare Aircraft Stationing Aid (AAW) |
| 711 | Create Atmospheric Refractive Data Set (CARDS) |
| 714 | The OAML Navy Standard Radar Sea Clutter (CLUTTER) Model |
| 725 | Sound Focus (SOCUS) |
| 727 | Standard Electromagnetic Propagation (Standard EM Prop) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 735 | Rowland-Rotter Evaporation Duct Model (RRM) |
| 737 | Electromagnetic Propagation Conditions Summary (PCS) |
| 738 | Electronic Countermeasures (ECM) Effectiveness Display |
| 740 | Electromagnetic (EM) Coverage Diagram (COVER) |
| 741 | Electromagnetic (EM) Path-loss vs. Range (LOSS) |
| SEA LEVEL PRESSURE | |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 525 | High Resolution Analysis System/Global Spectral Model (HIRAS / GSM) |
| 546 | High Resolution Analysis |
| 613 | CLIMAT-The Climatology Model |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 719 | D-Values |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 735 | Rowland-Rotter Evaporation Duct Model (RRM) |
| 748 | Laser Range Prediction (LRP) |
| 751 | Ooyama Analysis |
| 752 | Pressure Altitude/Density Altitude (PADA) |

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|--------------------------------|--|
| SEA LEVEL PRESSURE (Continued) | |
| 753 | Pilot Balloon (PIBAL) |
| 757 | Radiosonde Initial Analysis (RIA) |
| SMOKE | |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 531 | DATSAV2 Surface |
| 532 | Summary of the Day |
| 614 | COMBIC—Combined Obscuration Model for Battlefield Induced Contaminants |
| 617 | FITTE—The Fire Induced Transmission and Turbulence Effects Module |
| STATIC PRESSURE | |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 535 | DATSAV2 Upper Air |
| 549 | Upper-Air Window Analysis |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 735 | Rowland-Rotter Evaporation Duct Model (RRM) |
| TEMPERATURE | |
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 510 | Synthetic 3-D Atmospheric Temperature: A Model for Known Geophysical Power Spectra Using a Hybrid Autoregression and Fourier Technique |
| 521 | AGRMET |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 525 | High Resolution Analysis System / Global Spectral Model (HIRAS / GSM) |
| 527 | Relocatable Window Model (RWM) |
| 529 | Surface Temperature Model |
| 531 | DATSAV2 Surface |
| 532 | Summary of the Day |
| 534 | DATSAV2 Rocketsonde |
| 535 | DATSAV2 Upper Air |
| 536 | DATSAV2 Aircraft |
| 539 | Radiosonde |
| 546 | High Resolution Analysis |
| 547 | Eighth Mesh Surface Temperature Analysis |
| 548 | Boundary Layer Window Analysis |
| 549 | Upper-Air Window Analysis |
| 613 | CLIMAT—The Climatology Model |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 707 | Aircraft Icing (AIRICE) |

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-------------------------|--|
| TEMPERATURE (Continued) | |
| 723 | Tomahawk Land Attack Missile (TLAM) Wind and Temperature Correction |
| 725 | Sound Focus (SOCUS) |
| 726 | Sea-Surface Temperature Analysis and Composite (SSTAC) |
| 729 | Tomahawk Anti-Ship Missile (TASM) Effective Wind Model |
| 730 | Tomahawk Environmental Calculation Aid (TECA) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 735 | Rowland-Rotter Evaporation Duct Model (RRM) |
| 748 | Laser Range Prediction (LRP) |
| 751 | Ooyama Analysis |
| 753 | Pilot Balloon (PIBAL) |
| 757 | Radiosonde Initial Analysis (RIA) |
| 759 | Ship Ice Accretion (SHIP ICE) |
| TRACE GASES | |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 513 | PLEXUS |
| TRANSMISSIVITY | |
| 501 | Electro-Optical Tactical Decision Aid (EOTDA) |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 507 | Moderate Spectral Atmospheric Radiance and Transmittance (MOSART) |
| 512 | Atmospheric Radiance Code/Auroral Atmospheric Radiance Code (ARC/AARC) |
| 513 | PLEXUS |
| 612 | BITS—Broadband Integrated Transmittances |
| 614 | COMBIC—Combined Obscuration Model for Battlefield Induced Contaminants |
| 615 | COPTER—Obscuration Due to Helicopter Lofted Snow and Dust Module |
| 616 | FASCAT—Atmospheric Illumination Module |
| 617 | FITTE—The Fire Induced Transmission and Turbulence Effects Module |
| 618 | GRNADE—Self-Screening Applications Module |
| 620 | KWIK—A Munition Expenditures Module |
| 621 | LASS—Large Area Screening Systems Application Module |
| 622 | LOWTRN—Atmospheric Transmittance/Radiance Module |
| 623 | LZTRAN—Laser Transmittance Module |
| 624 | MPLUME—Missile Smoke Plume Obscuration Code |
| 625 | NBSCAT—Narrow Beam Multiple Scattering Module |
| 626 | NMMW—Near Millimeter Wave Module |
| 627 | NOVAE—Nonlinear Aerosol Vaporization and Breakdown Effects Module |
| 628 | OVR CST—Contrast Transmission Module |
| 629 | PFNDAT—Aerosol Phase Function Data Base |
| 630 | RADAR—Millimeter Wave System Performance Module |
| 633 | TARGAC—Target Acquisition Model |

Model/DB Title of Model or Database

TRANSMISSIVITY (Continued)

| | |
|-----|--|
| 634 | UVTRAN—An Ultraviolet Transmission and Lidar Simulation Module |
| 635 | XSCALE— Natural Extinction Module |
| 639 | AGAUS—A Mie Code |
| 710 | Battle Group Vulnerability (BGV) |
| 727 | Standard Electromagnetic Propagation (Standard EM Prop) |
| 728 | Surface-Search Radar (SRR) Range Table |
| 740 | Electromagnetic (EM) Coverage Diagram (COVER) |
| 741 | Electromagnetic (EM) Path-loss vs. Range (LOSS) |
| 742 | Electronic Support Measures (ESM) Range Tables |
| 745 | High Frequency Communications (HF COMMS) |
| 747 | HF Lowest Usable Frequency (HF LUF) |
| 749 | HF Maximum Usable Frequency (HF MUF) Program |
| 754 | Platform Vulnerability |

VISIBILITY

| | |
|-----|---|
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 531 | DATSAV2 Surface |
| 536 | DATSAV2 Aircraft |
| 541 | RTNEPH 6-Month |
| 613 | CLIMAT—The Climatology Model |
| 743 | Forward-Looking Infrared (FLIR) System Prediction |
| 748 | Laser Range Prediction (LRP) |

WINDS

| | |
|-----|---|
| 504 | Night Vision Goggle Operations (NOWS) Weather Software Database |
| 505 | FASCOD3 (to be FASCODE4 or FASE) |
| 521 | AGRMET |
| 522 | Atmospheric Slant Range Path Analysis Model (ASPAM) |
| 525 | High Resolution Analysis System/Global Spectral Model (HIRAS / GSM) |
| 531 | DATSAV2 Surface |
| 532 | Summary of the Day |
| 533 | DATSAV2 Satellite |
| 534 | DATSAV2 Rocketsonde |
| 535 | DATSAV2 Upper Air |
| 536 | DATSAV2 Aircraft |
| 537 | PIBAL |
| 538 | Winds Aloft |
| 539 | Radiosonde |
| 546 | High Resolution Analysis |
| 548 | Boundary Layer Window Analysis |
| 549 | Upper-Air Window Analysis |

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-------------------|---|
| WINDS (Continued) | |
| 550 | Vertical Velocity Analysis |
| 613 | CLIMAT-The Climatology Model |
| 701 | Seakeeping Evaluation Program (SEP) Wind and Wave Database |
| 705 | Navy Operational Regional Atmospheric Prediction System (NORAPS) |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 709 | Meteorological Ballistic Winds and Densities Model (BALWIN) |
| 711 | Create Atmospheric Refractive Data Set (CARDS) |
| 720 | Warnings Plot |
| 721 | Wind Conversion Utility (TRUE WIND) |
| 722 | Tropical Cyclone Module |
| 723 | Tomahawk Land Attack Missile (TLAM) Wind and Temperature Correction |
| 725 | Sound Focus (SOCUS) |
| 729 | Tomahawk Anti-Ship Missile (TASM) Effective Wind Model |
| 730 | Tomahawk Environmental Calculation Aid (TECA) |
| 732 | Tactical/Environmental Ship Routing (TESR) |
| 733 | Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) |
| 734 | Direct Method Evaporation Duct (DMED) Model |
| 737 | Electromagnetic Propagation Conditions Summary (PCS) |
| 743 | Forward-Looking Infrared (FLIR) System Prediction |
| 746 | Historical Wind Speed (HWS) |
| 750 | Multivariate Optimum Interpolation (MVOI) |
| 753 | Pilot Balloon (PIBAL) |
| 757 | Radiosonde Initial Analysis (RIA) |
| 759 | Ship Ice Accretion (SHIP ICE) |

WINDS-SPECIFIC FEATURES

| | |
|-----|--|
| 531 | DATSAV2 Surface |
| 532 | Summary of the Day |
| 536 | DATSAV2 Aircraft |
| 706 | Navy Operational Global Atmospheric Prediction System (NOGAPS) |
| 720 | Warnings Plot |
| 722 | Tropical Cyclone Module |
| 732 | Tactical/Environmental Ship Routing (TESR) |

APPENDIX I

INDEX OF NEAR-SPACE ENVIRONMENT DATA TYPES

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|---------------------------|--|
| AURORAL PARTICLE | |
| 512 | Atmospheric Radiance Code/Auroral Atmospheric Radiance Code (ARC/AARC) |
| 513 | PLEXUS |
| 516 | Improved Aurora Precipitation Model (IAPM) |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| COSMIC RAYS | |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| DIFFUSE ZODIACAL EMISSION | |
| 513 | PLEXUS |
| 556 | Celestial Background Scene Descriptor (CBSD) |
| ENERGETIC PARAMETERS | |
| 514 | Combined Radiation and Release Effects Satellite Proton Flux (CRRESPRO) Model |
| 515 | Combined Radiation and Release Effects Satellite Space Radiation (CRRESRAD) Model |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| GEOMAGNETIC FIELD | |
| 513 | PLEXUS |
| 518 | Magnetosphere Specification and Forecast Model |
| 554 | Jacchia Atmospheric Density (JAD) Model, 1970 |
| GEOMAGNETIC STORMS | |
| 514 | Combined Radiation and Release Effects Satellite Proton Flux (CRRESPRO) Model |
| 515 | Combined Radiation and Release Effects Satellite Space Radiation (CRRESRAD) Model |
| 517 | Interplanetary Shock Propagation Model |
| 518 | Magnetosphere Specification and Forecast Model |
| 519 | Solar Wind Transport Model |
| 520 | Solar Flare Forecast Model |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| INTERPLANETARY MEDIUM | |
| 517 | Interplanetary Shock Propagation Model |
| 519 | Solar Wind Transport Model |
| 555 | Space Environmental Specification and Forecast System (SESFS) |

| <u>Model/DB</u> | <u>Title of Model or Database</u> |
|-------------------------------|---|
| LOW ENERGY PLASMA ENVIRONMENT | |
| 518 | Magnetosphere Specification and Forecast Model |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| LUNAR PARAMETERS | |
| 513 | PLEXUS |
| 556 | Celestial Background Scene Descriptor (CBSD) |
| 724 | Solar/Lunar Almanac Program (SLAP) |
| METEOROIDS AND DEBRIS | |
| 513 | PLEXUS |
| 556 | Celestial Background Scene Descriptor (CBSD) |
| NEUTRAL ENVIRONMENT | |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| 556 | Celestial Background Scene Descriptor (CBSD) |
| POLAR CAP ABSORPTION | |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| RADIO BACKGROUND NOISE | |
| 513 | PLEXUS |
| SOLAR PARAMETERS | |
| 513 | PLEXUS |
| 520 | Solar Flare Forecast Model |
| 554 | Jacchia Atmospheric Density (JAD) Model, 1970 |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| 556 | Celestial Background Scene Descriptor (CBSD) |
| 724 | Solar/Lunar Almanac Program (SLAP) |
| SPORADIC E | |
| 555 | Space Environmental Specification and Forecast System (SESFS) |
| STAR AND PLANETARY POSITIONS | |
| 513 | PLEXUS |
| 556 | Celestial Background Scene Descriptor (CBSD) |

Model/DB Title of Model or Database

SUDDEN IONOSPHERIC STORMS

555 Space Environmental Specification and Forecast System (SESFS)